2018

Applying UTAUT to Determine Intent to Use Cloud Computing in K-12 Classrooms

Dorothy Cortez Kropf
Walden University

Walden University

College of Education

This is to certify that the doctoral dissertation by

Dorothy Cortez Kropf

has been found to be complete and satisfactory in all respects,
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Review Committee
Dr. Wellesley Foshay, Committee Chairperson, Education Faculty
Dr. Michael Marrapodi, Committee Member, Education Faculty
Dr. Gerald Giraud, University Reviewer, Education Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
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Abstract

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Dorothy Cortez Kropf

MA, Liberty University, 2011

BS, Liberty University, 2009

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Education

Walden University

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Abstract

Although school districts provide collaborative cloud computing tools such as OneDrive and Google Drive for students and teachers, the use of these tools for grading and feedback purposes remains largely unexplored. Therefore, it is difficult for school districts to make informed decisions on the use of cloud applications for collaboration. This quantitative, nonexperimental study utilized Venkatesh et al.'s unified theory of acceptance and use of technology (UTAUT) to determine teachers' intent to use collaborative cloud computing tools. Online surveys with questions pertaining to UTAUT's predictor variables of performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC) and UTAUT's criterion variable of behavioral intent (BI) were administered to a convenience sample of 129 teachers who responded to an email solicitation. Pearson correlation results of $r = 0.781$, $r = 0.646$, $r = 0.569$, and $r = 0.570$ indicated strong, positive correlations between BI and PE, EE, SI, and FC respectively. Spearman rho correlations results of $r_s = 0.746$, $r_s = 0.587$, $r_s = 0.569$, and $r_s = 0.613$ indicated strong, positive correlations between BI and PE, EE, SI, and FC respectively. Simple linear regression results indicated that PE and EE are strong predictors of BI when moderated by age, gender, experience, and voluntariness of use (VU). SI is a strong predictor of BI when moderated by gender, but not by age, experience, and VU. This study's application of the UTAUT model to determine teachers' BI to use collaborative cloud computing tools could transform how administrators and educational technologists introduce these tools for grading and feedback purposes. This study contributes to the growing body of literature on technology integration among K-12 teachers.

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Acknowledgments

"The journey matters as much as the goal." *Kalpana Chawla*

I thank God for giving me the strength and perseverance to complete this incredible journey and for blessing me with these wonderful people:

My deepest gratitude to my husband and my best friend, René, for his steadfast love, support, and sacrifice. I thank my sons, Miles and Grant, for believing in me. Special thanks to Dr. Rob Foshay for his patience and guidance and for teaching me to search for the strength of evidence behind every claim. I thank Dr. Michael Marrapodi for his positive feedback and encouragement. Finally, special thanks to my friends for cheering me on every step of the way.

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Chapter 1: Introduction to the Study

This study addresses the use of cloud computing for collaboration among K-12 teachers in the United States. Research studies (e.g., Udoh, 2012) indicated that cloud computing is a promising technology for collaboration. Management Association (2016) refers to cloud computing as an "on-demand network of shared pool" of resources wherein individuals collaborate while engaging in a "dynamic information updating" process (p. 22). This information updating process is characterized by the sharing of an online space to virtually create and edit files while giving and receiving feedback (Grant & Basye, 2014). Cloud computing is a computing model centered on a network platform which "establishes a bridge for data flow and exchange" (Management Association, 2016, p. 23).

In education, collaborative cloud computing, or the use of cloud computing applications to facilitate collaboration, encompasses student-participatory activities including peer-to-peer editing, group work, and teacher-to-student interactions including discussion forums and online grading and feedback. As a technology paradigm, collaborative cloud computing facilitates "collection and annotation of learning materials, organization of knowledge in a useful way, retrieval, and discovery of useful learning materials from the knowledge space, and delivery of adaptive and personalized learning materials" (Apalla, Kuthadi, & Marwala, 2017, p. 1011). To successfully connect collaborators with real-time data, a virtual on-demand repository of shared resources must be used. Chen, Ta-Tao, and Kazuo (2016) referred to this "large pool of computing resources" as a "shared IT infrastructure" wherein "scattered resources are linked together through the Internet" (p. 102). Zhang, Zhang, Chen, and Huo (2010) referred to the cloud drive as a virtual application that can "deploy, allocate, or reallocate" resources dynamically for file management and collaboration" (p. 94).

Research on collaborative cloud computing has been well documented in higher education where opportunities for peer-to-peer and student-to-instructor collaboration and support inquiry has also increased (Donna & Miller, 2017) but research on collaborative cloud computing in K-12 education is severely lacking (Soobin, Warschauer, & Binbin, 2016). There has been an increased number of school districts that provide collaborative cloud computing tools (cloud drives) for their students, faculty, and staff (Johnson, Levine, Smith, & Haywood, 2010; Nagel, 2013), but efforts to investigate how collaborative cloud computing can benefit teachers and students in K-12 learning environments are scarce (Soobin et al., 2016). Cloud computing for collaboration remains unexplored in K-12 classrooms and teachers use cloud drives to store classroom files including syllabi, assignments, assessments, and other classroom handouts. Despite the availability of collaborative cloud computing tools such as Google Drive and OneDrive, K-12 teachers have not used these tools extensively. Therefore, teachers' behavioral intent to use collaborative cloud computing for grading and feedback purposes remains largely unexplored. The results of this study may significantly influence instructional delivery guidelines and best practices when introducing new technologies to

K-12 teachers and factors that are crucial when integrating new technologies into K-12 classrooms.

This chapter includes the background of this study as well as its problem statement, purpose, research questions and hypotheses, and theoretical framework. This chapter also includes the nature of this study, sample population, and the sources of my data, as well as the limitations and delimitations, the significance of this study, and its potential positive social implications. Finally, I will close this chapter with a summary.

Background

Verma, Dubey, and Rizvi (2012) explained that the use of collaborative cloud computing applications is common in many organizations. Accessing collaborative cloud computing applications is easier and more cost-efficient than “purchasing licenses and downloading software” (Lahiri & Mosely, 2013, p. 20). In education, Verma et al. (2012) “envisioned cloud computing’s impact to be significant” while enabling teachers to provide detailed feedback during the different stages of their students’ learning processes (p. 93). Its “enhanced collaboration possibilities contributed to the arguments for the use of collaborative cloud computing” (Meske, Stieglitz, Vogl, Rudolfph, & Öksü, 2014, p. 161). Alsufyani, Safdari, and Chang (2015) indicated that postsecondary institutions are experiencing the benefits of collaborative cloud computing including work efficiency, low cost, and sharing features that further promote scholarly research.

Educators and students currently use collaborative cloud computing applications such as cloud drives for simultaneous and asynchronous collaboration. Hartmann, Nygaard Braae, Pederson, and Khalid (2016) further explained the potential role of collaborative cloud computing in education:

> The prominent advantage of cloud computing is it enhances student collaboration, which promotes motivation and helps keep the students responsible for their own work within the community. The universal access to data across time, space, and devices allows the teaching, learning, and collaboration to take place anywhere and at any time. (p. 200)

There is a lack of scholarly research on collaborative cloud computing among K-12 teachers (Soobin et al., 2016; Yim, Warschauer, Zheng, & Lawrence, 2014; Zheng, Lawrence, Warschauer, & Lin, 2013). Although many K-12 institutions provide cloud computing applications to teachers and students (Nagel, 2013; Johnson, 2013), it is unclear if teachers are using these technologies for grading and feedback purposes. Soobin et al. (2016) explained that "the lack of relevant educational research on this topic makes it difficult for school districts to make informed decisions about adopting applications for instruction" (p. 3).

In any type of teacher training, Jager and Lokman (2000) suggested a bottom-up approach wherein the perspectives of the teachers are taken into consideration first before changes are implemented rather than institution-wide mandates on several aspects of teaching. Therefore, before any research on the potential benefits of collaborative cloud computing applications for K-12 schools can be conducted, a study to determine K-12 teachers' behavioral intent to perform collaborative cloud computing for grading and feedback purposes with a theoretical framework that measures the teachers' intrinsic and extrinsic needs and their perceptions of the technology is necessary. Therefore, I used Venkatesh, Morris, Davis, and Davis' (2003) unified theory of acceptance and use of technology (UTAUT; see Figure 1) as the theoretical framework for this study. According to the UTAUT model, an individual's behavioral intent to use technology and actual use of technology depend on his or her perspectives about the technology and can vary according to the individual's age, gender, experience with similar technology, and voluntariness of use.

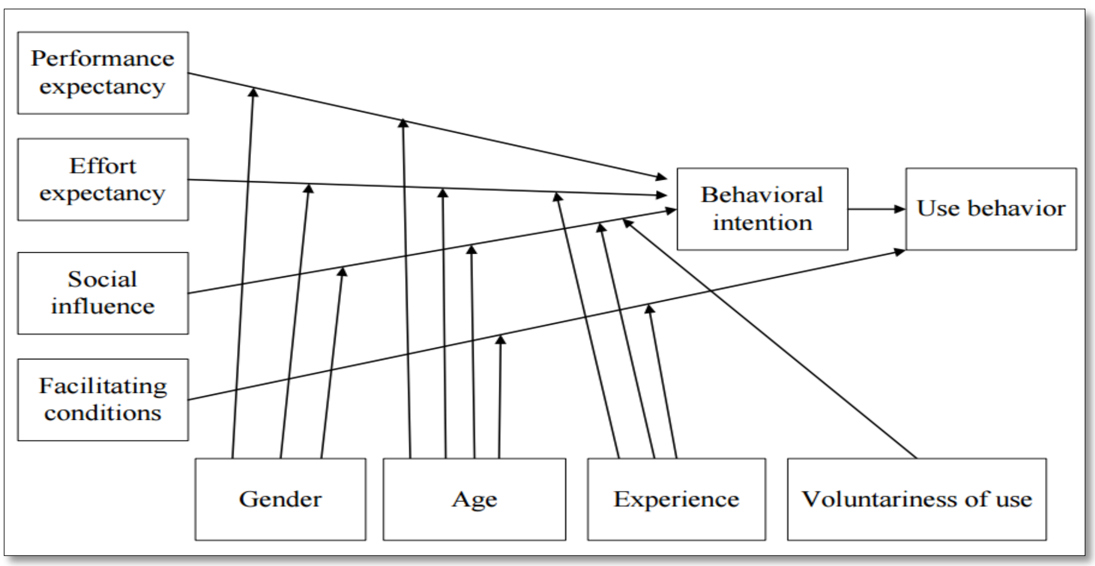

Figure 1. Unified theory of acceptance and use of technology (UTAUT). From "User Acceptance of Information Technology: Toward a Unified View," by V. Venkatesh, M.G. Morris, G.B. Davis, & F.D. Davis, 2003, *Management Information Systems Quarterly, 27*, p. 447.

Using Venkatesh et al.'s (2003) UTAUT model to predict K-12 teachers' behavioral intent to use collaborative cloud computing for grading and feedback purposes is necessary. Previous studies using the UTAUT model indicated that performance expectancy (PE), effort expectancy (EE), and social influence (SI) can predict behavioral intent (BI) to adopt new technologies while facilitating conditions (FC) can predict actual technology use. Akbar (2013) reported that Venkatesh et al.'s (2003) UTAUT model and instrument have been applied to multidisciplinary research with emphases on varying cultural contexts. UTAUT studies conducted outside of the United States include Mbrokoh's (2016) study on the factors that influence consumers to use online banking in Ghana and research on Chinese family caregivers' BI to use e-health intervention in Canada by Chiu and Eysenbach (2010).

UTAUT studies conducted in the United States, including Anderson et al.'s (2006) study on the determinants of the use of PC tablets among university professors and Eckhardt, Laumer, and Weitzel's (2009) study on the BI of information technology (IT) leaders to use curriculum vitae (CV) databases, are fewer than those conducted outside of the United States. Moreover, UTAUT studies conducted in the United States, specifically in education, remain scarce. To fill this research gap, I sought to determine if UTAUT's constructs can predict the BI to use collaborative cloud computing for grading and feedback purposes among K-12 teachers in the United States. This study may be the first conducted in the United States using the UTAUT model to determine the factors that can influence K-12 teachers' BI to use collaborative cloud computing for grading and feedback purposes.

Problem Statement

One of the reasons school districts have not successfully deployed new technologies such as collaborative cloud applications to teachers is the lack of scholarly research (Thomas, Menon, Boruff, Rodriguez, & Ahmed, 2014). Therefore, it is difficult for school districts to make informed decisions about adopting new technologies (Soobin et al., 2016). Mulvaney (2016) indicated that while web-based cloud computing applications may be accessible to teachers, these applications are not often used in daily instruction. Shotlekov and Charkova (2014) reported:

> Educating students in the cloud is something relatively new to teaching practices, however it opens many perspectives and allows students to work collaboratively, share experience and accumulate skills which will be tremendously important in the technologically advanced times we live in. Despite all the contribution to education and learning, cloud computing poses a great challenge to many teachers who not only have to be creative educators, but ICT-skilled instructors as well. (p. 291)

Reidenberg, Russell, Kovnot, Norton, and Cloutier (2013) suggested that school district administrators must enact policies and implementation plans the moment they offer cloud computing applications to their teachers, students, and staff. Although school districts offer their teachers, students, and staff access to cloud drives such as OneDrive or Google Drive, most teachers use these collaborative cloud computing tools to convert their printed materials into electronic versions but still preserve their traditional teaching methods. This study contributes to the growing amount of literature on collaborative cloud computing in K-12 classrooms. Identifying a theoretical framework to determine the factors that can predict the use of collaborative cloud computing for grading and feedback purposes is critical for school administrators before they can invest more time and resources to introduce, reintroduce, train, and retrain teachers to use collaborative cloud computing applications beyond their storage and file management capacities. Since Venkatesh et al.'s (2003) UTAUT, a technology acceptance model, is extensively used in healthcare, business, IS, and higher education, I decided to apply UTAUT's constructs in this study.

Purpose of the Study

The purpose of this quantitative study was to determine if Venkatesh et al.'s (2003) UTAUT constructs are strong predictors of K-12 teachers' behavioral intent to use collaborative cloud computing for grading and feedback purposes. Using UTAUT's survey questionnaire, this correlational study examined if the independent variables, performance expectancy, effort expectancy, social influence, and facilitating conditions, are strong predictors of the dependent variable, behavioral intent to use collaborative cloud computing for grading and feedback purposes. The UTAUT model has four moderating variables: age, gender, experience, and voluntariness of use. This study may contribute to the growing body of literature in which researchers explore the determinants of technology adoption among K-12 teachers.

Research Questions and Hypotheses

This study addressed the following research questions and hypotheses:

Questions and Hypotheses 1-4

Questions 1 to 4 and their corresponding hypotheses pertain to the potential relationships between each of the UTAUT variables:

RQ1: What is the relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$1: There is no relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a1: There is a relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ2: What is the relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$2: There is no relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a2: There is a relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ3: What is the relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$3: There is no relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a3: There is a relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ4: What is the relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$4: There is no relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a4: There is a relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

Questions 5 to 8 pertain to the relationships between UTAUT's predictor variables and UTAUT's criterion variable when moderated by age:

Questions and Hypotheses 5-8

Questions 5 to 8 pertain to the relationships between UTAUT's predictor variables and UTAUT's criterion variable when moderated by age:

RQ5: To what extent does the moderator age moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$5: Age does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a5: Age moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ6: To what extent does moderator age moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$6: Age does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a6: Age moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ7: To what extent does moderator age moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

H_07: Age does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a7: Age moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ8: To what extent does moderator age moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

H_08: Age does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a8: Age moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

Questions and Hypotheses 9-12

Questions 9-12 pertain to potential relationships between UTAUT's predictor variables and UTAUT's criterion variable when moderated by gender:

RQ9: To what extent does moderator gender moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$9: Gender does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a9: Gender moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ10: To what extent does moderator gender moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$10: Gender does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a10: Gender moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ11: To what extent does moderator gender moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$11: Gender does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a11: Gender moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ12: To what extent does moderator gender moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$12: Gender does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a12: Gender moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

Questions and Hypotheses 13-16

Questions 13-16 pertain to potential relationships between the UTAUT's predictor variables and UTAUT's criterion variable when moderated by experience (number of years of experience using collaborative cloud computing tools):

RQ13: To what extent does moderator experience moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$13: Experience does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a13: Experience moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ14: To what extent does moderator experience moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$14: Experience does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a14: Experience moderates the relationship between K-12 EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ15: To what extent does moderator experience moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$15: Experience does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a15: Experience moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ16: To what extent does moderator experience moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$16: Experience does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a16: Experience moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

Questions and Hypotheses 17-20

Questions 17-20 pertain to potential relationships between UTAUT's predictor variables and UTAUT's criterion variable when moderated by VU:

RQ17: To what extent does moderator VU moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$17: VU does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a17: VU moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ18: To what extent does moderator VU moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$18: VU does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a18: VU moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ19: To what extent does moderator VU moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$19: VU does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a19: VU moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ20: To what extent does moderator VU moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$20: VU does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a20: VU moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

Theoretical Framework

This quantitative study was guided by Venkatesh et al.'s (2003) UTAUT. Venkatesh et al. posited that performance expectancy, effort expectancy, social influence, and facilitating conditions are strong predictors of behavioral intent to use certain technologies, facilitating conditions is a strong predictor of use behavior, and that age, gender, experience, and voluntariness of use moderate these constructs. UTAUT was developed based on eight technology acceptance theories which are further discussed in Chapter 2.

Researchers have used Venkatesh et al.'s (2003) UTAUT model in healthcare, business and information systems, and higher education studies to explore the factors that can predict people's behavioral intent to use certain technologies. UTAUT's independent variables are a) performance expectancy, b) effort expectancy, c) social influence, and d) facilitating conditions. UTAUT's moderators are a) age, b) gender, c) experience, and d) voluntariness of use. The dependent variable is behavioral intent to use collaborative cloud computing for grading and feedback purposes (from Figure 1). The validity of each of the constructs and moderators of UTAUT and the reliability and validity of the UTAUT questionnaire will be discussed in Chapter 3.

Nature of Study

This is a quantitative correlational research study, guided by hypotheses, and designed to observe whether there are correlations among the independent variables and the dependent variable and to what extent the moderating variables affected the relationships between the independent variables and the dependent variable. In this study, I investigated whether Venkatesh et al.'s (2003) UTAUT independent variables (see Figure 1) were strong predictors of K-12 teachers' behavioral intent to use collaborative cloud computing applications for grading and feedback purposes. UTAUT's variables of PE, EE, SI, and FC were the independent variables and BI to use was the dependent variable for this study. Age, gender, experience, and voluntariness of use (VU), as established by Venkatesh et al. were the moderators I used for this study.

Principal Component Analysis (PCA)

I performed a principal component analysis (PCA) to examine whether I can reduce the 16 survey items based on the UTAUT model to fewer factor loadings. This statistical test helped me transform several potential variables that are correlated into smaller number of uncorrelated variables, as suggested in Laerd Statistics (2012a).

Correlational Research Design

In this study, I employed a correlational research design to determine whether there were relationships between each of the UTAUT's constructs and K-12 teachers' BI to use collaborative cloud computing for grading and feedback purposes. Creswell (2008) indicated that correlational research studies can explain relationships between variables and can indicate which variables are strong predictors of a certain phenomenon. Gabbiadini and Greitmeyer (2007) indicated that correlational analysis can pinpoint "how variables differ from one another and how these differences can also relate to each other" (p. 134).

Simple Linear Regression

I performed a simple linear regression to determine if the relationships between UTAUT's independent variables (PE, EE, SI, and FC) and UTAUT's dependent variable (BI) are statistically significant when moderated by UTAUT's moderators of age, gender, experience, and VU.

Sample and Location

The population from which the samples were drawn included K-12 public school teachers in the Pacific Coast region of the United States. There were no specific groups or types of teachers excluded in this sampling frame. I used Faul et al.'s (2009) G*Power 3.1.9.2. software with the developers' recommended effect size of .20 for a small sample size, .05 probability error, .80 power, and 4 predictors, resulting to this study's total required sample size of 65. My target sample size was 100.

I employed a convenience sampling method to collect data from K-12 teachers as the unit of analysis. Based on the California Common Core State Standards, students as young as kindergarteners should use technology to write, edit, and publish their written assignments:

> With guidance and support from adults, students explore a variety of digital applications to produce and publish writing, including in collaboration with peers and participate in shared research and writing projects. (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010, pp. 21-22)

Sources of Data

In this study, I employed a cross-sectional survey design. Field (2009) indicated that cross-sectional designs can be used to measure multiple variables at one point in time. Using Venkatesh et al.'s (2003) UTAUT questionnaire, I observed the extent of the correlation of UTAUT's constructs or independent variables (PE, EE, SI, and FC) with the dependent variable (BI) to use collaborative cloud computing for grading and feedback purposes. I received permission to use the UTAUT model and the UTAUT instrument (see Appendix A). Permission to use the survey included modifications I made to the survey such as replacing the word *system* with *collaborative cloud computing for grading and feedback purposes* and the omission of use behavior (UB) as a dependent variable. By using the UTAUT survey, I was able to determine if UTAUT's moderators of age, gender, experience, and VU affected the strength of correlations between the independent variables and the dependent variable.

Definition of Terms

Defining specific terms adds "precision" to a scientific study (Firestone, 1987, p. 16). Throughout this study, I used the following terms:

- *Administrators:* K-12 school leaders including principals, vice-principals, superintendents, board members, and heads of schools.
- *Behavioral intent (BI):* "A person's relative strength of intention to perform a behavior" (Coffman, 2014, p. 41). Venkatesh (2013) described BI as a person's conscious decision to do something or to implement something in his or her future behavior.
- *Cloud computing:* The storing and managing of data through utilization of cloud-based remote servers instead of local area networks and the facilitating of online collaborations by making documents available to specific individuals (Grant & Basye, 2014). Examples of cloud-based remote servers are Google Drive, One Drive, and Dropbox.
- *Collaboration:* The term "collaboration" has been defined by several researchers. This study will utilize Morel's (2014) definition: Collaboration is a form of learning characterized by mutual respect and trust wherein individuals are receptive to other people's ideas, can share and defend points of view, and can reflect on the feedback they receive to achieve their goals.

- *Effort expectancy (EE):* The basis to which "individuals decide to use technology if they believe that using it is easy" (Ghandalari, 2012, p. 802). According to Venkatesh et al., (2003), individuals are more likely to use a technology if they see it as easy to use.
- *Experience:* The number of years that a person claims to use a similar technology. "Users often employ the knowledge they gained from prior experience with similar technologies to form the basis of their intentions" (Coffman, 2014, p. 54).
- *Facilitating conditions (FC):* The basis to which individuals decide to use technology if they believe that "technical and organizational infrastructures are available for them to use it (Ghandalari, 2012, p. 803). According to Venkatesh et al., (2003), individuals are more likely to use technology if they perceive that they will get sufficient support to learn and to use the technology
- *Feedback:* "Comments, questions, or error corrections written on students' assignments" (Mack, 2009, p. 34).
- *Performance expectancy (PE):* The basis to which individuals decide to use technology if they believe that using it can positively affect their "job performance" (Ghandalari, 2012, p. 803). According to Venkatesh et al., (2003), individuals are more likely to use technology if they see it as something that can improve their job performance.
- *Social influence (SI):* The basis to which individuals decide to use technology

if they believe that the people who are important to them are already using it or will support them in using it (Ghandalari, 2012). According to Venkatesh et al., (2003), individuals are more likely to use technology if they perceive that people who are important to them approve their use of this technology.

- *Use behavior (UB):* Self-reported construct that explains one's use of certain technology (Venkatesh, 2013).
- *Voluntariness of use:* The extent to which the use of certain technology is not mandated (Agarwal & Prasad, 1997).

Assumptions

Lewis-Beck et al. (2004) stated that "assumptions are ubiquitous in social science and are the starting axioms and postulates that yield testable implications spanning broad domains" (p. 33). The assumptions for this study include the following:

1. Participants will answer the questions truthfully.
2. UTAUT variables will predict BI to use collaborative cloud computing among K-12 teachers.
3. UTAUT moderators will be accurately assessed with the UTAUT survey questionnaire.
4. Data collected for this study will yield results to specific group of K-12 teachers and therefore cannot be generalized to all K-12 teachers.
5. A sufficient number of responses (completed surveys) will be submitted.

Scope and Delimitations

Scope and delimitations for this study were as follows:

1. The study was limited to K-12 teachers in various public-school districts in the Pacific Coast area of the United States and therefore, results cannot be generalized. The decision to limit this study to one region was based on feasibility and cost-efficiency.
2. Using the convenience sampling method, participants of this study self-reported after receiving email invitations from school districts to voluntarily participate in this study. One of the disadvantages of convenience sampling method is that it could yield bias effects such as overrepresentation or underrepresentation of groups of people (Laerd Statistics, 2012e).
3. Because this was not a longitudinal study, it was limited to measuring the participants' BI to use one specific technology at one specific time. The participants' responses could change over time.
4. Because the purpose of this study was to examine whether UTAUT variables can predict BI, I examined only the variables and moderators of UTAUT.
5. Because UB, one of UTAUT's dependent variables, is a self-reported variable, I did not include it in this study.

Limitations

This nonexperimental study had certain limitations. First, nonexperimental designs have no cause and effect inferences made to "describe, differentiate, or examine relationships, as opposed to direct relationships between or among variables, groups, or situations" (Sousa, Driessnack, Mendes, & Costa, 2007, p. 502). Sousa et al. (2007) also explained that nonexperimental studies are used for observations only, therefore, researchers lack the ability to randomize control groups and manipulate variables. Correlational research is also a "systematic investigation" of relationships or associations between the variables and do not yield "direct cause-effect relationships" (Sousa et al., 2007, p. 503). However, correlational designs are used to determine if changes in one or more variables can influence the changes in the other variable(s). Finally, this study was not longitudinal and was not designed to record how and to what extent the participants' viewpoints will change over time.

Significance of this Study

Transforming the way teachers teach with meaningful feedback and the way students engage with their teachers is the significance of this study. Findings of this study may contribute to the growing body of literature that aims to identify the determinants of BI to use technology among K-12 teachers. School districts across the United States have provided cloud computing applications such as Google Drive and OneDrive for their students and teachers (Johnson et al., 2013) but it is unclear whether teachers intend to use these applications for grading and feedback purposes. Therefore, to fill the research gap, I sought to determine whether there were relationships between K-12 teachers' PE, EE, SI, FC and their BI to use collaborative cloud computing applications for grading and feedback purposes and if the moderators of age, gender, experience, and VU impact these variables.

This study demonstrated its potential to gain new ground in understanding teachers' BI to use certain technologies. Educational researchers, educational technology providers, school administrators, and educational technologists can benefit from understanding the different and complex factors that affect teachers' BI to use certain technologies. Ultimately, by providing greater understanding of the factors that drive teachers to continuously use efficient technologies for teaching and learning, this study can help administrators and educational technologists transform the design and implementation of teachers' professional development programs.

Social Change

The use or nonuse of certain technologies by teachers consistently interests many educational researchers (Friedman, Bolick, Berson, & Porfeli, 2009). In this study, I examined the strength of UTAUT's constructs in U.S. school districts. This examination was necessary and a worthwhile contribution to the growing number of studies on teachers' behavioral intent to use certain technologies. In this study, I delved into the potential benefits of collaborative cloud computing applications in K-12 classrooms. The results are pivotal in determining the significant factors that school administrators need to be aware of when introducing or integrating collaborative cloud computing for instructional purposes in K-12 classrooms. Finally, when applied to K-12 professional development programs for K-12 teachers, the extent to which K-12 schools use collaborative cloud computing applications may significantly impact the way teachers and students collaborate with one another and the way teachers grade and provide feedback for their students.

Summary

In this quantitative correlational research study, guided by Venkatesh et al.'s (2003) UTAUT model, I sought to determine whether PE, EE, SI, and FC are strong predictors of K-12 teachers' BI to use cloud computing for grading and feedback purposes and whether this intent differs when UTAUT's moderators of age, gender, experience, and VU are applied. This chapter covered the background of this study, the nature of this study, its sampling population, and source of data. The chapter also included the instrumentation, research questions, and the hypotheses of this study as well as its significance and its social change. A literature review on collaboration, cloud computing, and technology acceptance models including UTAUT is discussed in Chapter 2.

Chapter 2: Literature Review

Introduction

This chapter is comprised of a review of literature relevant to this study. Guided by Venkatesh et al.'s (2003) UTAUT model, this study addressed the need for scholarly research on the use of collaborative cloud computing for grading and feedback purposes among K-12 teachers in the United States. The chapter begins with literature review on collaboration, cloud computing, collaborative cloud computing, and their applications and benefits in the areas of healthcare, business and information systems, and higher education. The chapter also covers the history and critical reviews on UTAUT and other technology acceptance models and the models' major theoretical propositions and applications to studies in healthcare, business and information systems, and higher education and their relevance to this study. A rationale for selecting UTAUT as the theoretical framework for this study is also provided in this chapter. This chapter closes with a summary.

Literature Search Strategy

The literary search strategy for this literature review consisted of searches in academic online databases of scholarly research such as JSTOR, EBSCO, Academic Search Complete, and ProQuest. Literature search for this study involved searching for scholarly materials on the topics of cloud computing and the applications of cloud computing in education including collaboration and the application of Venkatesh et al.'s (2003) UTAUT model. The search for scholarly materials on cloud computing in the field of education yielded 508 empirical studies, meta-analyses, and theoretical commentaries published from 2008 to 2017, of which only 191 were conducted in the United States. The search for scholarly materials on Venkatesh et al.'s UTAUT model resulted to 758 empirical studies, meta-analyses, and theoretical commentaries published from 2006 to 2017, of which 103 studies relate to healthcare, 19 studies relate to finance including online banking, 295 studies relate to business and information systems, and 309 studies relate to education. In education, out of 309 empirical studies, meta-analyses, and theoretical commentaries, only a handful of studies pertained to secondary schools. Of the total 758 studies on UTAUT, only 14 empirical studies, meta-analyses, and theoretical commentaries were conducted in the United States. The remaining empirical studies, meta-analyses, and theoretical commentaries were relevant to understanding the behavioral intent to use and use of certain technologies among consumers.

Cloud Computing

"Cloud computing is the promising technology for collaborative and participatory approach" (Udoh, 2012, p. 113). Management Association (2016) referred to cloud computing as an on-demand network or "shared pool" of resources in which individuals collaborate while engaging in a "dynamic information updating" (p. 22). The author added that cloud computing has changed the way people work. Cloud computing is the storing and managing of data through the utilization of cloud-based remote servers instead of local area networks and facilitating online collaborations by making documents available to specific individuals (Grant & Basye, 2014). Yadav (2014) referred to cloud computing as an "internet-based computing in which shared resources, software, and information are delivered as a service that computers or mobile devices can access on demand" (p. 3109). The on-demand feature of cloud computing has made it ubiquitous for many organizations and institutions, including healthcare, business and information systems, and education. However, Zheng et al. (2013) indicated that there is a paucity of empirical research on cloud computing for collaborative activities in K-12 classrooms, specifically, wherein cloud storage applications are used to provide feedback to students.

In healthcare, researchers from the Cloud Standards Customer Council (2012) explained that "patient centricity has become the key trend, leading to the steady growth in the adoption of electronic medical records (EMR), electronic health records (EHR), personal health records (PHR), and other technologies related to integrated care, patient safety, point-of-care access to demographic and clinical decision support" (p. 11). In business and information systems, cloud computing has been accepted as effective and cost efficient (Devasena, 2014). Devasena added that cloud computing has provided small- and medium-sized businesses "increased collaboration, allowing employees to synchronize and work on documents and shared applications simultaneously from their own place" (p. 3).

Cloud computing has also increased productivity while helping employees create a healthy balance between personal and professional lives (Devasena, 2014). Cloud services include "automatic software upgrades and security updates" (Devasena, 2014, p. 3). In education, Yadav (2014) added that "free or low-cost cloud-based services are used by learners and educators to support learning, social interaction, content creation, publishing, and collaboration" (p. 3109). Cloud drives can be accessed remotely through web-based servers instead of local area networks while giving teachers and students the ability to access their files from anywhere, 24/7. Examples of web-based cloud drives used in education are Google Drive and OneDrive. These cloud-computing applications also provide teachers and students computer application suites that include email, calendar, word processing, spreadsheet, and slide presentation applications.

Administrators, faculty, and staff of educational institutions realized the advantages of using cloud-computing applications (Misevičienė, Budnikas, & Ambrazienė, 2011). "The most important features of cloud computing are social communication and the collaborative processing of documenting by using the integrated office and file storage and sharing" (Misevičienė et al., 2011, p. 268). Cloud computing in education can be as elaborate as teachers providing meaningful feedback for their students. Yadav (2014) outlined some of the potential benefits of cloud computing for educational institutions, described in the following subsections:

- Personalized Learning: Cloud computing "affords opportunities for greater student choice in learning" (Yadav, 2014, p. 3111). Students can access online resources that interest them.
- Cost-effectiveness or Reduced Costs: Many institutions provide free-of-charge cloud drives to their students, faculty, and staff. Some cloud drives

have office applications for word-processing, presentation, and email programs while the others can provide pay-per-use programs for their customers.

- **Accessibility:** Students and teachers can access class materials, 24/7 and from any location and device.
- **Elimination of Additional Infrastructure:** Maintaining large networks for educational institutions can be costly. Schools face the risks of corrupt and compromised files that are harmful to their networks and computer systems. Cloud computing provides a low-cost and secure alternative without the need for costly upgrades and maintenance.
- **Reduced Carbon Footprint:** Printing hundreds of handouts for teachers and students can get very expensive quickly, and schools are spending hundreds of dollars purchasing and maintaining printing machines or copiers. Cloud drives can reduce the schools' carbon footprints.
- **User-Friendly Technology:** Many teachers avoid complex technologies due to time limitations. Cloud drives may be easier for teachers to use and operate. Although Yadav (2014) identified potential benefits of cloud computing, many organizations identified some concerns about this technology. For instance, Venkatesh (2013) posited that "since collaborative cloud computing technologies are either packaged by a single vendor or are meshed and sold as integrated solutions sandbox consisting of several vendors, the primary concern of organizations is the vendor trustworthiness" (p. 3). Guided by the UTAUT developers' own technology acceptance model, and Davis' (1989) Technology Acceptance Model

> (TAM), Venkatesh et al. (2013) aimed to "identify backgrounds and behavioral intentions of organizations that resulted to the implicit trust of cloud computing architectures" (p. 14) and to "comprehend the backgrounds and behavior that cause individuals and organizations to implicitly trust cloud computing environments" (p. 15).

Venkatesh (2013) indicated that the UTAUT provides a "holistic model to capture people's attitudes and intentions to adopt cloud computing solutions" (p. 63). The participants in Venkatesh' study were IT professionals from organizations representing different types of industries. There were 430 respondents to the UTAUT survey but only 42% of the surveys were completely answered. The effect size was "0.15 with 5 predictors and a response probability of 0.05" (p. 15). Venkatesh explained that "no specific tests for validity were conducted because the instrument scales were based on both TAM and UTAUT models which were already proven to be reliable and valid" (p. 87).

Cronbach's alpha test was performed and confirmed UTAUT's high internal reliability. Data analyses also included the application of (Analysis of Variance) ANOVA, Multiple Regression, Factorial Analysis, and Chi-Square Tests" (Venkatesh, 2013, p. 59). UTAUT and TAM variables (independent variables) were examined with "intent to implicitly trust or adopt cloud computing solutions, technology use and application, and security apprehension (dependent variables) (Venkatesh, 2013, pp. 119-120). Study findings indicated that perceived use (PU) and perceived ease of use

(PEOU) were strong predictors of trust in cloud computing providers and the reliability of cloud computing providers. UTAUT variables of PE, EE, SI, and FC were strong predictors of BI.

The strength of evidence in Venkatesh' (2013) study is high. Previous studies confirmed the reliability and validity of Venkatesh, Morris, Davis, and Davis' (2003) UTAUT model and Davis' (1989) TAM model. The study was purposely framed on identifying the correlations between the independent and dependent variables. Venkatesh was self-critical, ensuring that all assumptions were addressed. As both small and large organizations are vulnerable to network security breach from computer viruses and hackers, the primary concern of IT professionals in Venkatesh' study was trustworthiness and reliability of cloud providers. However, in Paquet's (2013), study, the main concern for participating consumers was their vulnerability to security breach.

Paquet (2013) conducted a quantitative study that provided information about consumer perceptions on "the level of security in cloud computing and if security is the main deterrent for clouds computing adoption" (p. 3). The study was based on "security themes from IBM information security capability reference model to help identify security areas" (p. 1). Paquet's (2013) study's theoretical framework was Davis' TAM. Paquet determined the study's sample size by using "Bartlett, Kotrlik, and Higgins' (2001) recommendations for regression and factor analysis" (p. 66). The study's minimum sample size of 250 was based on a 5% margin of error and 95% confidence interval with 3% anticipated response rate. Paquet (2013) acquired 317 participants which increased the response rate by 2% and the completion rate by 3%.

Study findings in Paquet's (2013) study indicated that perceived usefulness was a strong predictor of the use of cloud computing. Paquet posited that "when perceived ease of use increases, the adoption of cloud computing increases" (p. 100) and when cloud security certification increases, the adoption of cloud computing tends to increase" (p. 102). The author explained that consumers feel more secure using cloud computing applications if part of their purchases include "cloud security certificates" (p. 110). Finally, participants in Paquet's (2013) study who were employed in "educational, banking, financial, health services, retails, and transportation organizations rated security with cloud computing certification from above neutral to very much" (p. 110).

The strength of evidence for Paquet's (2013) study is moderate. Although the participants in the study were categorized as members of different industries, Paquet did not fully explain the "other" category. The author also assumed that each participant was the primary decision maker for each organization and this assumption was considered a limitation. Finally, Paquet (2013) admitted that the study's "data may be skewed due to lack of familiarity of the participants with the different security issues, regulations, and/or IT governance" (p. 112). Although Paquet's study consisted of participants who were believed to be primary decision makers in the purchase and adoption of cloud computing, Dawson's (2015) study comprised of IT leaders from different higher education institutions.

The purpose of Dawson's (2015) study was to "examine the relationship between perceived usefulness, perceived ease of use, perceived security, perceived reliability, perceived benefits (the independent variables) and cloud computing adoption (the dependent variable) among university IT decision makers (p. 5.). Institutional leaders use cloud computing to enhance teaching and learning (Gutiérrez-Carreón, Daradoumis, & Jorba, 2015). For example, integrating cloud technology within a learning platform is more efficient than using the two technologies separately. This integration contributed to higher student and teacher satisfaction. Dawson's quantitative correlational study was framed with Davis' (1989) TAM model to measure attitudes towards technology and to identify the reasons why individuals choose to use specific technologies. Although the study's recommended size was 116, 217 participants completed the survey. Study findings indicated that IT decision-makers in higher education showed "significant levels of perceived usefulness, perceived ease of use, perceived security, perceived reliability, and perceived benefits" (p. 92). These significant levels of positive perceptions towards technology influenced the participants' decisions to adopt cloud computing for their institutions. Dawson (2015) explained that the advantages of using cloud computing technologies in education were further confirmed in this study.

The strength of evidence in Dawson's (2015) study is high. The results of the study confirmed Davis' (1989) argument that "perceived usefulness and perceived ease of use are strong indicators of a person's willingness to adopt or use technology" (p. 92). Dawson also had a sufficient sample size of 217 which was a much higher participation rate from the recommended sample size of 116. The researcher used rigorous methods when defining reliability and validity of measures and provided extensive literature review which contributed to definitive recommendations for future studies.

In both Paquet's (2013) and Dawson's (2015) studies, individual positions and professional roles affect people's decisions to adopt cloud computing technologies. In Joglekar's (2014) correlational research study, consumers' age, gender, and education were examined in relation to their decisions to adopt cloud computing technologies. Based on the premise that cloud computing providers must examine the demographics of cloud drive users, Joglekar indicated that "by gaining an understanding of the types of consumers who are willing to adopt the technology, the study can help marketing managers of cloud service providers create effective marketing collateral needed to promote their services" (p. 2). Davis' (1989) TAM was the theoretical framework for this study. Joglekar (2014) used Paquet's (2013) study as the a priori study needed to validate the TAM survey.

The sample size recommendation for Joglekar's (2014) study was 108. The number of completed responses collected was 128. The participants' education (in years) yielded a positive relationship with the use of cloud computing, however, the relationship was not significant. Neither gender nor was age a significant factor that can influence consumers to use cloud computing. However, the impact of gender and age on the independent variables were not evaluated. One of the limitations of Joglekar's study was the researcher's failure to evaluate various marketing materials that organizations use to target their consumers. Marketing collateral varies depending on the age, gender, and education of the target population. The strength of evidence of Joglekar's (2014) study was low. Literature review was limited to a few studies that may help readers understand the connection between consumers and their perceptions of cloud computing but there was no indication as to how the framework can explain perceptions of consumers towards advertising and if the advertising method is a deterrent to their use of cloud computing.

Although the TAM model has been used extensively to determine the factors that influence adoption of cloud computing in higher education institutions, Klug (2014) took a different approach by using the "Technology Organization-Environment (TOE) Framework" (p. 5). The study was based on the premise that since higher education showed trends of increasing use of cloud computing, it was important to conduct a study that can help understand the determining factors of the adoption of cloud computing in various colleges and universities. Klug's purpose was to determine if relative advantage, complexity, and compatibility, organizational and environmental contexts will have significant relationships with the use of cloud computing. The recommended sample size for the study through power analysis was 118. A total of 119 Chief Information Officers (CIO) and IT/IS managers of American and Canadian colleges and universities completed the survey. Study findings indicated that there was no significant relationship between relative advantage and use of cloud computing. Complexity's relationship with the use of cloud computing was also not significant. Klug (2014) was aware that these study's findings contradicted Powelson's (2011) findings wherein complexity had a significant relationship with the use of cloud computing.

In Alqallaf's (2016) study, one country that was "striving to develop its educational system to work abreast of all other sectors of the country to face the rapid changes taking place in the rest of the world is Kuwait" (p. 16). The premise of Alqallaf's study was based on the need to help Kuwaiti students gain technological skills. The purpose of the study was to examine Kuwaiti mathematical elementary teachers' perceptions on their ability to use mobile learning or m-learning and to determine the barriers that could discourage them from it. The study's theoretical frameworks were Constructivism and Technological Pedagogical Content Knowledge (TPACK). Constructivism posits that learning emerges from social activities. TPACK "provides ways to show educators' understanding of and skills to integrate technology when combined with the pedagogy and content knowledge needed in the classrooms" (Parr, Bellis, & Buffin, 2013, p. 11). There were 562 participants in this mixed methods study.

Alqallaf's (2016) study findings indicated that budget constraints, IT limitations, time constraints, and administrative support were the influencing factors that can result to teachers' use or nonuse of cloud computing. Alqallaf explained a disconnect between teachers' perceptions about cloud computing and the support available from their schools, districts, or the ministry of education. The study indicated that teachers of Mathematics had the highest self-perceptions of how knowledgeable they are in their pedagogy, content, and technical proficiency.

The strength of evidence in Alqallaf's (2016) study is low. Tests for validity and reliability of the instruments were not identified. The literature review strategy was not clearly stated and there were no definitive conclusions that can be drawn from the study. However, the study is relevant to this study's investigation of the use of cloud computing among K-12 teachers and had appropriately brought up the topic of the relationship of cloud computing and mobile computing or m-computing which Rouse (2007) referred to as the "nomadic computing" because of its portability and "access to the internet from anywhere in the world" (Weekley, 2016, p. 1).

The lack of scholarly research that seeks to discover the determinants of BI to use specific technologies among K-12 teachers is the primary reason behind this study. Studies conducted by Alqallaf (2016); Dawson (2015); Joglekar (2014); Klug (2014); Paquet (2013); and Venkatesh (2013) (See Table 1) confirmed the need to undertake a study that can identify some of the determinants of K-12 teachers' BI to use cloud computing for grading and feedback purposes in the United States. It is challenging to pinpoint the factors that can determine K-12 teachers' BI to adopt new technologies. The attitudes and perceptions of teachers towards cloud computing for grading and feedback purposes could be similar or different from the attitudes and perceptions of the participants in Alqallaf 's (2016); Dawson's (2015); Joglekar's (2014); Klug's (2014); Paquet's (2013); and Venkatesh's (2013) studies. Table 1 summarizes the primary research on cloud computing.

Table 1

Synthesis of Primary Research on Cloud Computing

Researcher	Empirical Findings	Strength of Evidence
Venkatesh (2013)	Strong predictors of intent to implicitly trust or adopt cloud computing: PE, PEOU, and security apprehension.	High
Paquet (2013)	Strong predictors of adoption of cloud computing were PEOU and availability of cloud security certification from cloud providers.	Moderate
Joglekar (2014)	Age & education had positive but not significant relationship with cloud computing adoption, however, there was no correlation between gender and cloud computing adoption.	High
Klug (2014)	Complexity was a strong predictor of cloud computing adoption; however, there was no correlation between relative advantage and cloud computing.	High
Dawson (2015)	Strong predictors of adoption of cloud computing were PEOU, PU, perceived security, perceived reliability, perceived benefits.	High
Alqallaf (2016)	Deterrents of cloud computing adoption: budget constraints, IT limitations, and administrator support.	Low

Note. a. PEOU: Perceived Ease of Use (similar to effort expectancy) b. PU: Perceived Use (similar to performance expectancy)

Collaboration

Jov et al. (2014) posited that based on the "Theory of Reasoned Action" (TRA), collaboration is only possible when it is perceived as useful by the participants involved" (p. 352). The author added that people's perceptions of the benefits of collaboration are based on their prior experience which can further increase their satisfaction or dissatisfaction. Fishbein and Ajzen (1975) explained that people's behavior such as willingness to collaborate are dependent on their beliefs which influence their attitudes and actions.

Dillenbourg (1999) posited that the term collaboration has been used exhaustively to describe different aspects of cooperation and is therefore difficult to define. For example, collaboration between healthcare service professionals refers to the "collection of patient information across the patient's continuum team to review root causes and to build comprehensive foundation that is person-centered" (Hardin, Kilin, & Spykerman, 2017, p. 5). In supply chain networks, collaboration can be defined as "two or more supply chain enterprise professionals working together to create a competitive advantage through information sharing, joint decision making, and sharing of the benefits of increased profitability that result from satisfying customer needs" (Long, 2017, p. 43). Collaboration among university researchers refers to the "trustful reciprocal communication that converges towards similar decision-making processes" (Bstieler, Hemmert, & Barczak, 2017, p. 47).

In identifying the major components of collaboration, Frey, Lohmeier, Lee, and

Tollefson (2006) emphasized the need for trust in collaboration, describing it as a critical element wherein individuals share their ideas frequently which leads to trusting one another. Members of a group agree to collaborate and trust each other to help them achieve their goals (Frey et al., 2006). The energies of the collaborators are joined together to build on each other's capacity to produce positive results (Frey et al., 2006).

Multidisciplinary researchers define collaboration in varying ways resulting to the emergence of common themes (See Table 2).

Table 2

Definitions of Collaboration Across Time

Research Studies and Publication Years	Definitions of Collaboration
Hastings (2009)	Collaboration is the carrying of each other's burden for a shared purpose
Rubin & Futrell (2009)	Collaboration is "a means of aligning people's actions to get something done" (p. 16).
Swartz & Triscari (2011)	Collaboration can be described as working as a team to achieve something that neither of the team members can achieve alone.
Wiseman, Tishby, & Barber, (2012)	Collaboration facilitates the co-creation of new knowledge.
Bevins & Price (2014)	Collaboration is "both reciprocal and recursive venture; individuals work together to achieve a shared purpose by sharing the learning experience, knowledge and expertise" (p. 271).
Morel (2014)	Collaboration is a form of learning characterized by mutual respect and trust; individuals are receptive to other people's ideas, can share and defend their points of view, and can reflect on the feedback they receive to achieve the goals.

Note. Stakeholders include library managers (Hastings, 2009), educational and community leaders (Rubin & Futrell, 2009), collaborative writing partners (Swartz & Triscari, 2011), psychotherapy clinicians (Wiseman et al., 2012), academics and teachers (Bevins & Price, 2014), and administrators and teacher leaders (Morel, 2014).

These themes include the collaborators' relationships with each other, built on trust and respect, mutual and reciprocal relationships wherein viewpoints are shared, and where members are committed to achieving their goals. Hastings (2009) posited that collaboration is the carrying of each other's burden for a shared purpose. Swartz and Triscari (2011) referred to collaboration as working as a team to achieve something that neither of the team members can achieve alone. The authors posited that collaborators work together, forming relationships just as powerful as the new knowledge they learned from their interactions with one another. The authors described this relationship as strong because of the respect and commitment that members have for each other. To Wiseman, Tishby, and Barber (2012), collaboration facilitates the co-creation of new knowledge. This definition of collaboration mirrored Swartz and Triscari's definition wherein new knowledge is created when the expertise and skills of all members are merged together.

Morel (2014) defined collaboration as a form of learning characterized by mutual respect and trust wherein individuals are receptive to other people's ideas, share and defend their viewpoints, and reflect on the feedback they receive to achieve their goals. Morel added that collaboration is an important skill in this digital age wherein working together involves coaches, team players, and peers who can communicate with each other through the web-based collaborative tools to achieve common goals. Working together despite of the differences in the collaborators' perspectives and skills, locations, or time zones can also promote creativity (Morel, 2014).

Collaboration is the formation of a team whose members are committed to contributing ideas to achieve concrete goals (Bevins & Price, 2014). The authors defined collaboration as "both reciprocal and recursive venture where individuals work together to achieve a shared purpose by sharing their learning experiences, knowledge, and expertise (p. 271). Without mutuality and respect, team members often will feel dissatisfied, demotivated, and uninterested in future collaborations.

For this study, Morel's (2014) definition of collaboration will be used because it reflects the microcosm of K-12 education in the United States where collaboration is a form of learning. Also, teachers' imparting of knowledge and ideas with their students characterized by mutual respect and trust while students trust and rely on their teachers to help them build on the ideas that they learned is a crucial component in K-12 classrooms. Collaboration also encourages students to explain and defend what they know and to learn from their teachers' feedback which contributes to the attainment of their academic goals.

Hastings' (2009) definition of collaboration is too broad and antiquated while Rubin and Futrell's (2009) definition of collaboration does not necessarily reflect the microcosm of K-12 environment and the term "aligning" is not an all- encompassing term that can capture all the complex components involved in K-12 collaboration. Students in K-12 classrooms must be given specific instructions and general expectations on the actions that must take place and the universal guidelines or standards as to how tasks can be performed to achieve their goals. The Common Core State Standards (2017) for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects suggest that these standards or expectations must be specifically instructed to students:

> Students advancing through the grades are expected to meet each year's standards for the grade level, retain or further develop skills and understandings mastered in preceding grades, and work steadily toward meeting the more general expectations described by the CCR standards. (p. 3)

Wiseman et al.'s definition of collaboration is a simplified version of Swartz and Tricari's (2011) definition of collaboration which lacks depth in identifying the needed skills of for students to understand ideas and opinions from multicultural and diverse perspectives. CCSS requires students and teachers to practice critical thinking with diversity in mind:

> Students appreciate that the twenty-first-century classroom and workplace are settings in which people from often widely divergent cultures and who represent diverse experiences and perspectives must learn and work together. Students actively seek to understand other perspectives and cultures through reading and listening and communicate effectively with people of varied backgrounds. They evaluate other points of view critically and constructively. Through reading great classic and contemporary works of literature representative of a variety of periods, cultures, and worldviews, students can vicariously inhabit worlds and have experiences much different from their own. (p. 6)

Bevin and Price's (2014) definition of collaboration was not selected as the construct definition of collaboration for this study because of its lack of emphasis on the teacher's role to teach students to defend what they know or to create and defend valid arguments with evidences. According to the Common Core State Standards (2017):

> Students cite specific evidence when offering an oral or written interpretation of a text. They use relevant evidence when supporting their own points in writing and

> speaking, making their reasoning clear to the reader or listener, and they constructively evaluate others' use of evidence (p. 6).

Morel's definition of collaboration encompasses all the standardized requirements and general expectations in CCSS. This study, in its aim to integrate technology into collaboration, also meets the CCSS standards on technology-integration in K-12 classrooms and the need for students to learn how to use these technologies to achieve their academic goals:

> Students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn through technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and media and can select and use those best suited to their communication goals. (p. 6)

Research on Collaboration

In psychodynamic therapy, collaboration is comprised of the relationship between the patient and the therapist, the goals they have set in place, and the agreement that the treatment plan executed by both the patient and the therapist is necessary for the patient's recovery (Bordin, 1979). Hatcher and Barends (2006) supported Bordin's definition of collaboration within a psychodynamic therapy as the agreement between the patient and the therapist which is crucial to patient recovery. In experiential therapy, the client and the therapist form an emotional bond (Berdondini, Elliott, & Shearer, 2012). In any type of collaboration, trust plays an important role in this bond and requires commitment from both the client and the therapist (Berdondini et al., 2012).

Collaboration is effective only when members can trust each other (Gillam, Counts, & Garstka, 2016). The agreement between a therapist and a client is to work together to help the client achieve his or her goals (Frey et al., 2006). In clinical psychology, the bond between the therapist and the client is therapeutic. Collaboration in a therapeutic relationship often leads to the surfacing of negative thoughts by the patient. The patient learns of these negative thoughts and such awareness can lead to a positive change (Dattilo & Hanna, 2012). A patient's awareness of negative thoughts can increase his or her desire to change, establishing a path towards recovery (Dattilo & Hanna, 2012). Collaboration requires mutual effort from both parties to openly communicate with each other (Berdondini et al., 2012).

In Devecchi and Rouse's (2010) study, the authors explored the relationship between teachers and teaching assistants (TA's) in two secondary schools in England. Each collaborator knows his or her own role which includes showing respect and trusting one another (Devecchi & Rouse, 2010). Collaboration in this study was purposeful, starting with an assessment of the needs of the students with physical and learning disabilities followed by the execution of plans on how the teachers and the TAs can meet these needs while aligning their plan with governmental standards. In a purposeful collaboration, members gain focus in systems that are sometimes fragmented because the issue of trust has been added (Fullan, 2010). In Devecchi and Rouse's study, (2010) the teachers and the TA's at the two research sites did not communicate with each other outside of their classrooms. During lunch, the two groups were also separated as teachers sat together on one end of the room while TAs comingle at the other end of the room. The two groups rarely spoke to one another during lunch.

A project that requires collaboration with one another was evidently new to both groups. Both teachers and TAs expressed different perspectives about their teaching roles. For instance, whereas teachers perceived their roles as the developers of lesson plans along with the strategies to deliver these lessons which include giving student feedback and exercising behavior management, the TA's perceived their roles also as responsible for behavior management, progress reports, and perceive themselves as the source of support for their students. Although at first, the teachers and the TA's rarely comingled with each other, there were no specific descriptions of their roles as teachers and TA's. The study opened new and different opportunities for them to access their resources and to improve their working relationships. Collaboration between the teachers and the TA's provided opportunities for both groups to support one another despite of the complexities of their relationships and both groups demonstrated respect for each other (Devecchi & Rouse, 2010).

Collaboration can also take place even when team members have different perspectives due to multicultural differences. In Tilley-Lubbs and Kreve's (2013) study, members came from various countries, socioeconomic status, ethnicities, and family customs and traditions. The study examined 32 graduate preservice teachers from Math and English as a Second Language (ESL) programs. The participants worked together to address "curricular and linguistic gaps that occur for English Language Learners (ELL) in content area classrooms" in the state of Virginia (Tilley-Lubbs & Kreve, 2013, p. 316). Participants reflected on their peers' perspectives. Collaborations started with face-to-face meetings and ended with email communications.

In Tilley-Lubbs and Kreve's (2013) study, participants could collaborate with other teachers in different domains which can help identify the gaps that exist in their own curriculum. During the different stages of their collaborations, participants critically analyzed the curriculum for both domains and created a new curriculum that eliminated gaps in both Math and ELL programs. The participating teachers generated discussions and reviewed each lesson to make recommendations on how to develop a multidisciplinary Math and ELL curriculum. Collaboration challenges include lack of time. Participants would rather complete the standardized materials such as syllabi and lesson plans on their own instead of working as a group to save time. This challenge reflects the microcosm of K-12 teaching environments wherein teachers' preferences for collaboration vary because of time constraints, lack of enthusiasm, and lack of commitment to learn to use cloud computing for grading and feedback purposes.

K-12 teachers often prefer to perform tasks such as grading and giving feedback for their students manually than using digital annotation and cloud computing tools. The strength of evidence in this study is high. Protocols on how teachers should collaborate were established. There was a reciprocity of contribution and participation among all members. The study is aligned with the working definition of collaboration in this study since members learned from one another and demonstrated respect for each other. Building ELL and Mathematics curriculum required group members to accept their peers' ideas and to reflect on the feedback they received from others to achieve their goals.

The need for group members to work together to achieve certain goals applies to online collaborations but unequal participation and unequal contributions from members can be challenging. Such is the case with Kyounghye and You-Kyung's (2013) study wherein online activities of primary and secondary on-site teachers across Korea who volunteered to participate in this study were examined as they collaborated in a "teacher-created online community" (p. 22). This online community is the largest of its kind in the country:

> Over 3,5000,000 postings on storytelling, online Q&A, and online peer support within the teaching community; over 16,619,900 postings on sharing of teaching materials within the online library; over 370,000 postings on storytelling, online Q&A, and online peer support within an online club; and over 200,000 postings on teacher-to-teacher online workshops (Kyoung & You-Kyung, 2013, p. 231).

In Kyounge and You-Kyung's study, there was an issue of unequal participation among the teachers. The voluntary nature of this online community contributed to this challenge as teachers were free to anonymously share and download materials from the site but did not have to contribute their own materials. The authors added that another challenge of having an online collaboration is the lack of teachers who volunteered to review the contributed materials to check for accuracy, reliability, and applicability in the classrooms. The authors suggested that this challenge could lead to a “mass dissemination of low quality teaching materials” (p. 237).

The strength of evidence in this study is moderate due to its lack of theoretical framework which restricted the authors from establishing foundations. There were no measures established to ensure the reliability and validity of the instrument in this study. There was also the lack of cultural sensitivity in this study because it did not consider both the cultural and local factors that could affect behaviors and trends. The group of participants in this study was not a representative of teachers and scholars outside of Korea who rely heavily on web-based repository for teaching materials. There was also no explanation or suggestion as to why some teachers participated and contributed while others failed to participate and contribute towards this online repository of teaching materials.

Ineffective collaboration does not exhibit respect and mutuality (Gillam, Counts, & Garstka, 2016). Even when individuals are provided with the up-to-date online collaborative tools, without respect and mutuality, collaborators cannot benefit from using these applications and may even feel dissatisfied and demotivated. However, this study is relevant to the study because of its emphases on the importance of collaboration among educators and its contribution to the growing number of studies that examine online collaborations in education.

There are complex relationships and different forms of collaboration in higher education. Bevins and Price's (2014) study sought to determine how academic researchers and instructors collaborate with one another. Framed under the conceptual framework of Group Dynamics which is categorized in three factors: "a) skill set, b) mutuality, and c) cohesion," the purpose of the study was to "theorize on the nature of academics and the teachers working together, drawing from existing literature and their own experiences and reflections on collaborative action research projects" (Bevins & Price, 2014, pp. 271-272). Combined, these factors constitute to one term: "team support," in which "reflection and continuous dialogue" can lead to effective collaborations (p. 272).

Using online collaboration tools can be frustrating especially when collaborators experience technical difficulties as evidenced in Brodahl, Hadjerrouit, & Hansen's (2014). In this study, college students used Google Docs and Etherpad to collaborate with each other. The theoretical frameworks used in the study were Social Constructivist Theory (SCT) and Community of Practice. Aliki, Menon, Boruff, Rodriguez, and Ahmed (2014) defined SCT as "a sociological theory of knowledge that focuses on how individuals come to construct and apply knowledge in socially mediated contexts" (p. 4). Community of Practice refers to "groups of people informally bound together by shared expertise and a passion for a joint enterprise" (Wenger & Snyder, 2000, p. 139).

The study sample consisted of 171 first-year education students in Norway. Study findings indicated that technical difficulties dissuaded the students from using technology for collaboration, however, the authors indicated that the group's size was a more influential factor in dissuading students from technology use than technical difficulties. The study also indicated that students were required to master the skill of working on a document with other students, in real time, without feeling confused or overwhelmed by the visible changes, remarks, and comments provided by other students. Students in this study were also unsure if they intend to use a similar technology for future collaborations.

The strength of evidence in Brodahl et al.'s (2014) study is low. There were validity issues on the qualitative data collection in this study. Students were not given instructions as to how much detail they should give their interviewers. The study also consisted of students from a single university. However, the study is relevant to this study because it examined the use of technology, specifically Google Docs, to encourage students to collaborate.

Another creative way to initiate collaboration in the classrooms is by using web-based presentation applications like Prezi as evidenced in Yong-Ming's (2015) study. The study was guided by Davis' (1989) Technology Acceptance Model (TAM). To analyze the use of collaborative technologies in higher education, the study added facilitating conditions (FC) and social influence (SI), which are constructs from Venkatesh et al.'s (2003) UTAUT model. FC refers to a supportive environment which can help facilitate the use of technology. SI refers to the importance of the opinions of friends, families, and professional circles when deciding to use new technologies (Yong-

Ming, 2015). The study was conducted in Taiwan and comprised of 56 college students who were also categorized according to their learning styles.

Study findings indicated that attitude was a significant and positive factor that directly influences one's BI to use technology followed by FC and SI (Yong-Ming, 2015). Additional findings indicated that FC ad SI contributed to the students' use of technologies to collaborate. Yong-Ming explained that when FC and SI are present, students are more motivated to use technology. These findings confirmed Venkatesh et al.'s argument that SI influences BI. The strength of evidence in this study is high. The study not only contributes to the growing number of studies on collaboration, but it also identified the limitations of "self-reported perceptions" of the students (p. 289). As discussed in Tilley-Lubbs and Kreve's (2013) study, perceptions differ among collaborators and are based on their history, religion, race, and other intrinsic and extrinsic factors even if the collaborators come from a small sample size and homogeneous groups. Steps were taken in this study to ensure reliability, validity, and generalizability. Yong-Ming's study is relevant to this study because of its use of a technology acceptance model that is comparable to this study's use of Venkatesh et al.'s technology acceptance model, UTAUT, which posits that SI contributes to one's BI to use technology and FC contribute to one's actual use of technology.

Stoyle and Morris (2017) posited that students develop deeper understanding of concepts if their peers or teachers take the time to explain them. In this quantitative, quasi-experimental research, the purpose of the study was to determine how collaboration through classroom blogs can support "mathematical reasoning" which was defined as "generation, justification, and argumentation" among 134 fifth graders in an Ohio elementary school (p. 116). Mathematical discourses took place in the control group, the blogging group, and the face-to-face group. Data for this study consisted of pre-tests, post-tests, and delayed post-tests or tests that took place after the students' winter vacation. The students' performance in the control and the blogging groups increased. Members of the blogging group performed better in the delayed tests than the members of the face-to-face group. Study findings indicated that collaboration among students through classroom blogs can contribute to higher retention of mathematical concepts.

Stoyle and Morris (2017) explained that blogging generated the types of explanations that were not present in face-to-face groups. For example, student bloggers who explained the concepts of fractions in a blog performed better than the students in the other groups during post-tests. The bloggers' explanations helped students solve problems that were relevant to adding and subtracting of mixed numbers. Student bloggers also performed better "under all conditions" and showed "greater retention in learning gains over time in delayed post-tests" (p. 122). Stoyle and Morris suggested that learning improves when students take the opportunity to use technology to provide explanations.

The strength of evidence in Stoyle and Morris' study is high. The collaboration between students demonstrated their mutual respect and trust while opportunities to provide explanations to share and defend their viewpoints helped them achieve their goals. The type of blogging in this study was aligned with Morel's (2014) definition of collaboration. The authors defined collaboration through technology as a "pedagogical approach" that provides room for engaging with the content while retaining what has been learned and understood over time (p. 124). On knowledge content, Rau, Bowman, and Moore (2017) indicated that:

> Prior research has not yet established that collaboration enhances learning of content knowledge from visual representations. This gap leaves the following question unanswered: Does an educational technology that supports student collaboration through visual representations enhance their learning of content knowledge? (p. 39)

Rau et al.'s (2017) study addressed this question through a quasi-experimental research consisting of a control group and experimental group wherein undergraduate chemistry students collaborated to discuss "connections among visual representations" (p. 39). In the control group, students collaborated by using "ball and stick models" on printed worksheets (Rau et al, 2017, p. 41). The experimental group discussed the same concepts with Chem Tutor, "an adaptive collaborative script" (p. 41).

The groups in Rau, Bowman, and Moore's (2017) study differed in many ways. The timing of the feedback received by the students varied since students in the control group received written and printed feedback three weeks later while students in the experimental group received instant feedback with digital annotations if students provided the wrong answers. In Rau et al.'s (2017) study, the "adaptive collaborative scripts" helped students make connections through "visual representations" which led to the understanding of complex concepts (Rau et al, 2017, p. 51). One of the limitations for this study was the "less stringent causal evidence in randomized control trials" (p. 51).

The strength of evidence in this study is low. There was a large gap in the timing of instructor-to-student feedback between the control group and the experimental group. Students need consistent yet shorter time to receive feedback from their instructors. The study did not have a working definition for collaboration, making it challenging to explain whether the collaborations that took place in both control groups met the authors' required criteria. It was unclear if collaborations in this study were designed to achieve specific goals or if the study's purpose was to simply create opportunities for collaboration.

Figure 2 synthesizes some insights drawn from my literature review on collaboration. Outcomes of collaboration included self-directed learning and scaffolding.

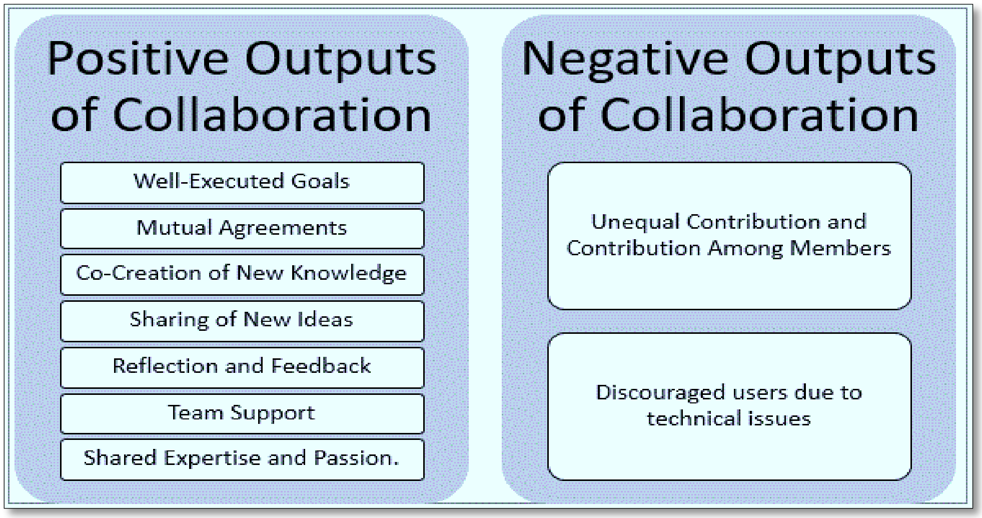

Figure 2. Literature Review on the Positive and Negative Outputs of Collaboration

Collaborations consist of peer-to-peer discourses. Technical difficulties can frustrate end-users as evidenced in Brodahl et al.'s (2014) study. Reciprocity of efforts to share resources should be encouraged as suggested in Kyounghe and You-Kung's (2013) and Bevins and Price's (2014) studies.

History of Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT model (See Figure 1) was developed by Venkatesh et al. (2003) based on eight technology acceptance models:

1. Theory of Reasoned Action (TRA)
2. Technology Acceptance Model (TAM)
3. Theory of Planned Behavior (TPB)
4. Diffusion of Innovation (DOI)
5. Motivational Models (MM)

6. Combined Motivational Model and Theory of Planned Behavior (C-TAM-TPB)
7. Model of PC Utilization (MPCU)
8. Social Cognitive Theory (SCT)

Theory of reasoned action (TRA). TRA (Fishbein & Ajzen, 1975) as illustrated in Figure 3 posited that "attitude and belief are strongly connected to each other" (p. 336).

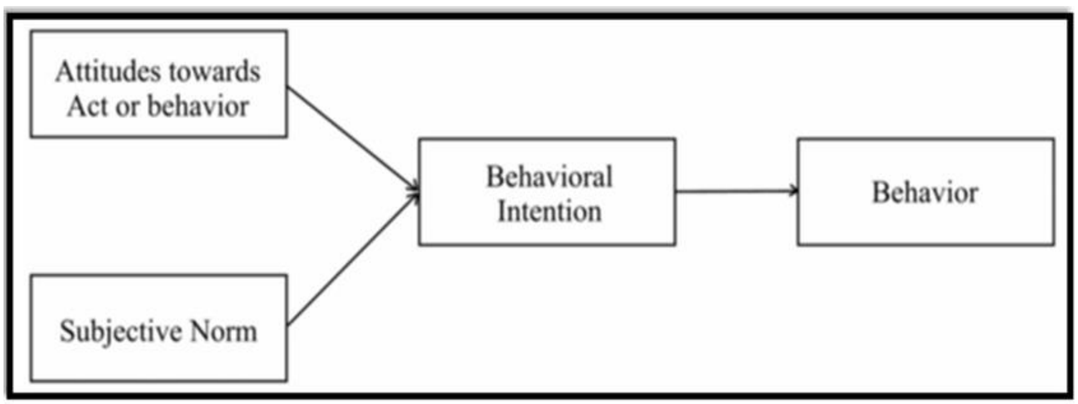

Figure 3. Theory of Reasoned Action (Fishbein & Ajzen, 1975)

The authors indicated that "the term attitude was introduced in social psychology as an explanatory device to understand human behavior" (p. 336). Krosnick and Petty (1991) posited that "attitudes are stable, consequential, and difficult to change" (p. 1). TRA suggests that a person's intention drives his or her behavior (Fishbein & Ajzen, 1975). Govender (2012) explained that the primary premise behind TRA is that an individual's intent to do something is a major predictor of his or her behavior. Govender posited that for an individual to achieve a goal, he or she must have the intent to achieve this goal and that attitude and subjective norms or "perceived social pressure" can drive a person's intent to achieve this goal (Ajzen, 2002, p. 2).

Technology acceptance model (TAM). TAM (Davis et al., 1999) as illustrated in Figure 4, posited that pivotal in understanding human behavior and one's tendency to accept or reject technology are perceived usefulness (PU) and perceived ease of use (PEOU).

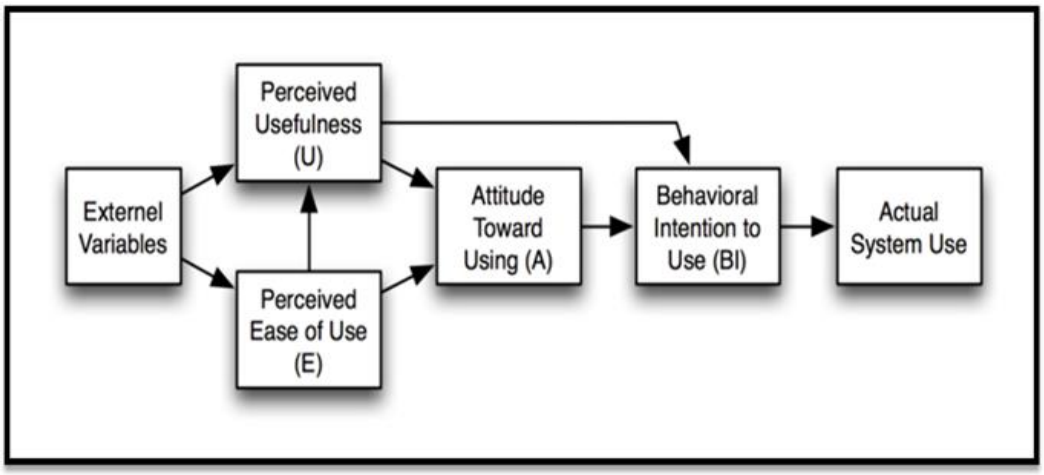

Figure 4. Technology Acceptance Model (Davis, 1989)

With PU, individuals must believe that technology will benefit them. With PEOU, individuals must feel confident that this technology is easy to use.

In a study comprised of Serbian Mathematics preservice teachers, Teo and Milutinovic (2015) used Davis' (1989) TAM model. Study findings indicated that attitudes towards computer use resulted to a direct positive influence on the person's BI to use a computer. This finding confirmed previous studies on the influence of attitude and BI towards actual use (Teo, 2009, Teo, 2013; Yuen & Ma, 2008). Study findings also indicated that attitude towards computer use yielded mediated effects on PU, PEOU or PEU, and BI to use technology. The authors suggested that teachers' positive attitudes towards computers were attributed to their PEOU with similar technologies.

Theory of planned behavior (TPB). TPB (Azjen, 1991) as illustrated in Figure 5 posited that a person's behavior is influenced or driven by his or her intentions and these intentions are attributed to one's "overall attitude towards behavior, the overall subjective norms surrounding the performance of the behavior, and the individual's perceived ease of use with which the behavior can be performed (behavioral control)" (Govender, 2012, p. 551). Azjen's (1991) TPB posited that attitude, subjective norms, and perceived control shape an individual's BI to use technology and UB.

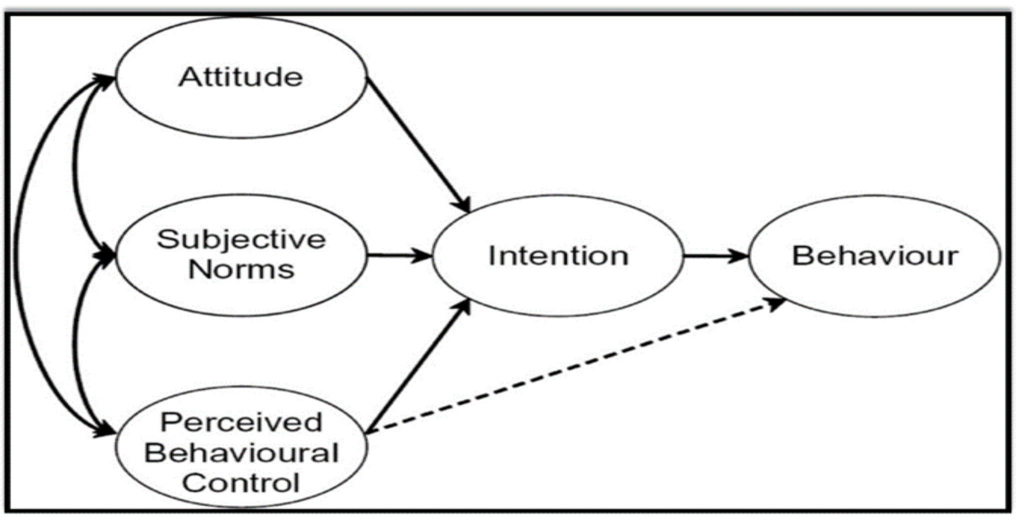

Figure 5. Theory of Planned Behavior (Ajzen,1991)

Diffusion of innovation (DOI). Another framework for understanding technology acceptance and technology use is Rogers' (2003) DOI as illustrated in Figure 6. DOI posited that individuals adopt innovations in a specific sequence or rate of adoption which has the potential to reach its critical mass. To understand this theory, adopters are categorized according to the time it takes for them to use the innovation.

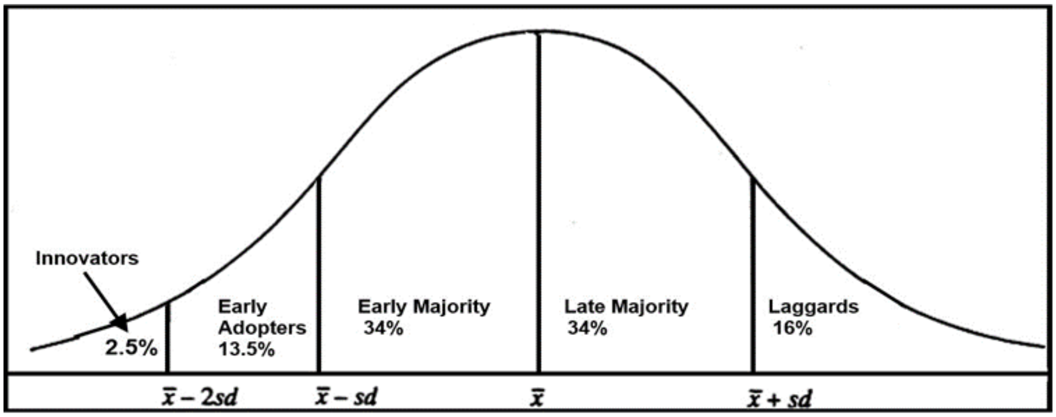

Figure 6. Diffusion of Innovation Model (Rogers, 2003)

If the first adopters successfully introduce the innovation to other individuals in their social circles causing a domino effect of introducing more people to the innovation, a bell-shaped curve over time will emerge signifying that the innovation has reached its critical mass. Teachers belong in social circles wherein influencers introduce new technologies that will be accepted by most of the teachers in an institution. Initial adopters in K-12 environment will most likely be concerned with the time it takes for them and the amount of training required for them to be proficient in using such technology. Teachers believe that time constraints and lack of training are some of the major barriers of using technology in the classrooms (National Center for Education Statistics, 1999). This explanation is consistent with Venkatesh et al.'s (2003) explanation of technology acceptance which indicated that SI and FC are strong predictors of BI to use technology.

Motivational model (MM). MM (Davis et al., 1992) as illustrated in Figure 7 explains why individuals choose one technology over another. MM involves intrinsic and extrinsic factors which include playfulness and enjoyment (Venkatesh et al., 2003). Studies that adopted the MM theory for specific contexts include Davis and Warshaw's

(1992) study which sought to understand new technology adoption and use in information systems.

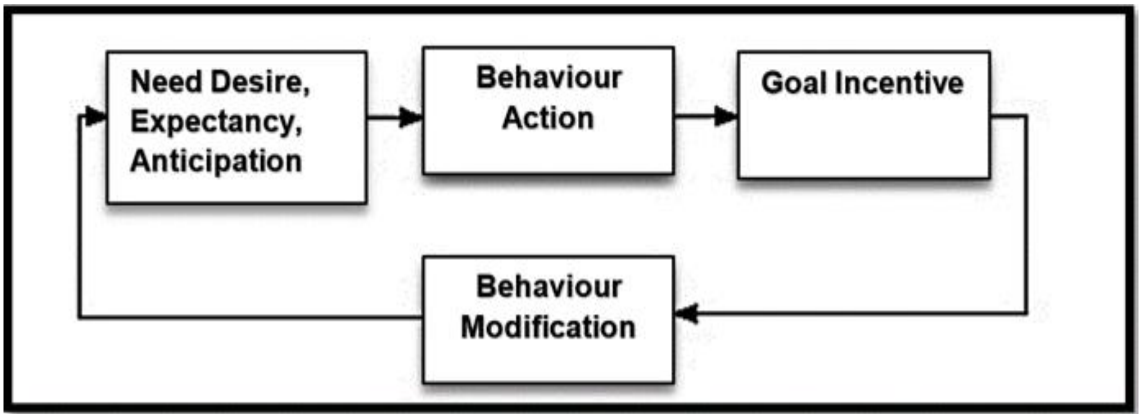

Figure 7. Motivational Model (Davis et al., 1992)

Combined motivational model and theory of planned behavior (C-TAM-TPB). C-TAM-TPB, as illustrated in Figure 8, is also called "Decomposed TPB," due to its decomposed belief structure that combines Davis' (1989) TAM's and Azjen's (1991) TPB's constructs (Venkatesh et al., 2003, p. 6).

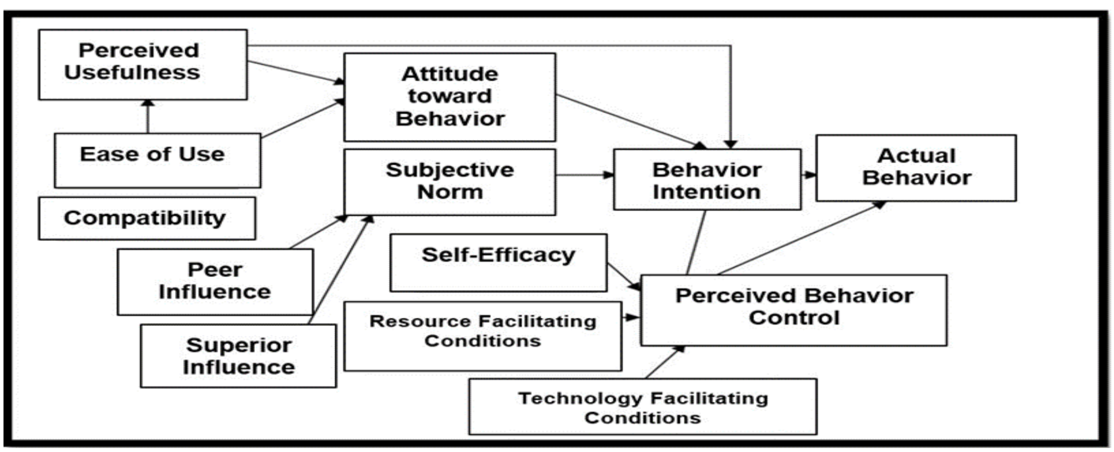

Figure 8. Representation of C-TAM-TPB Model (Venkatesh et al., 2003)

Model of PC utilization (MPCU). Thompson and Higgins (1991) MPCU posited that individuals' beliefs about technology are based on these factors: job fit, long term consequences, affect towards use, facilitating conditions, complexity, and social factors. Table 3 outlines MPCU's constructs and definitions. MPCU (See Figure 9) is appropriate in an environment where the use of technology is voluntary. Job fit refers to a person's compatibility to his or her job based on the person's needs and the demands of the job (Kristof-Brown, 2007). MPCU posits that employees are more satisfied with their jobs if these jobs can fill their needs (Tinsley, 2000). The long-term consequences construct of MPCU refers to the outcomes of technology use which are beneficial to employees in the future (Sharma & Mishra, 2014). The affect towards use consist of varying emotions that a person has towards certain technology. The complexity construct refers to an individual's perception of how easy or difficult it is to use or to learn to use a certain technology.

Table 3

Model of PC Utilization Constructs and Definitions

Constructs	Definitions
Job Fit	Basis to which technology is perceived to improve job performance (Venkatesh et al., 2003).
Long Term Consequences	Basis technology brings feelings of pleasure and joy (Venkatesh et al., 2003).
Affect towards Use	Social factors involve the consideration of other peoples' opinions and approvals (Venkatesh et al., 2003).
Facilitating Conditions	Basis to which individuals' perception of sustainable support as important (Venkatesh et al., 2003).
Complexity	Basis to which technology is perceived as challenging or too difficult to understand (Venkatesh et al., 2003).
Social Factors	Subjective culture and interpersonal agreements made with others in social situations" (Venkatesh et al., 2003, p. 7).

Note. From Venkatesh et al., 2003. Reprinted with permission.

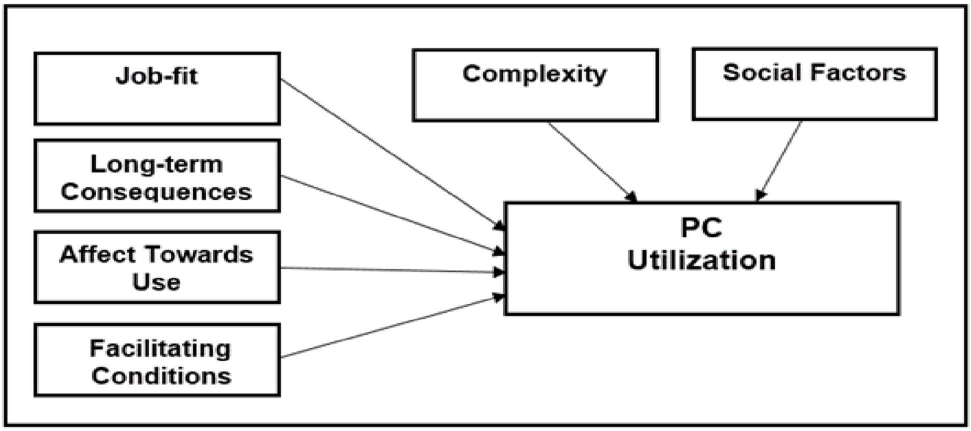

Figure 9. Model of PC Utilization (Thompson & Higgins, 1991)

Social cognitive theory (SCT). SCT is "a triadic structure that refers to the three major classes of determinants that act together as a whole" (Bandura, 2011, p. 359). According to Bandura, SCT "conceptualizes the interactional causal structure as triadic reciprocal causation" (Bandura, 2011, p. 359). The classes of determinants in SCT are personal factors, behavior, and environmental factors (See Figure 10). These intrinsic and extrinsic factors influence an individual's perception, intention, and decision.

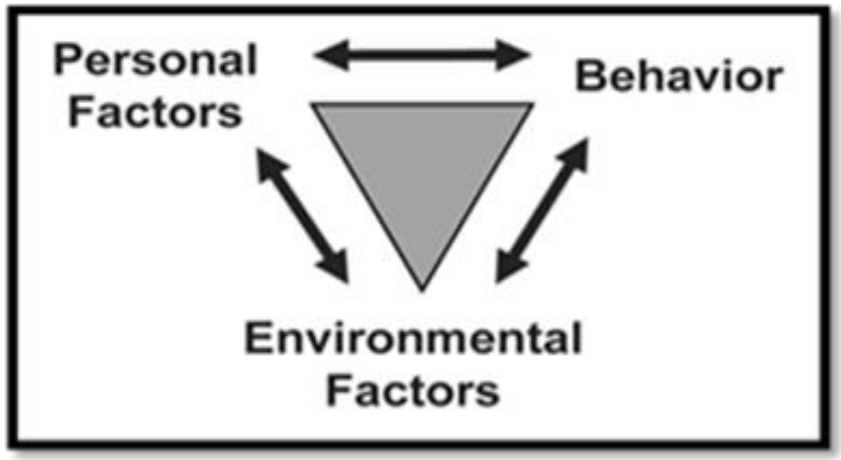

Figure 10. Social Cognitive Theory (Bandura, 2011)

Unified theory of acceptance and use of technology (UTAUT). Developed by Venkatesh et al. (2003), UTAUT (See Figure 11) consists of four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions" (p. 82). The moderators for UTAUT are a) gender, b) age, c) experience, and d) voluntariness of use. Venkatesh (2013) indicated that UTAUT can be categorized as an extension of TAM and is applicable to large populations.

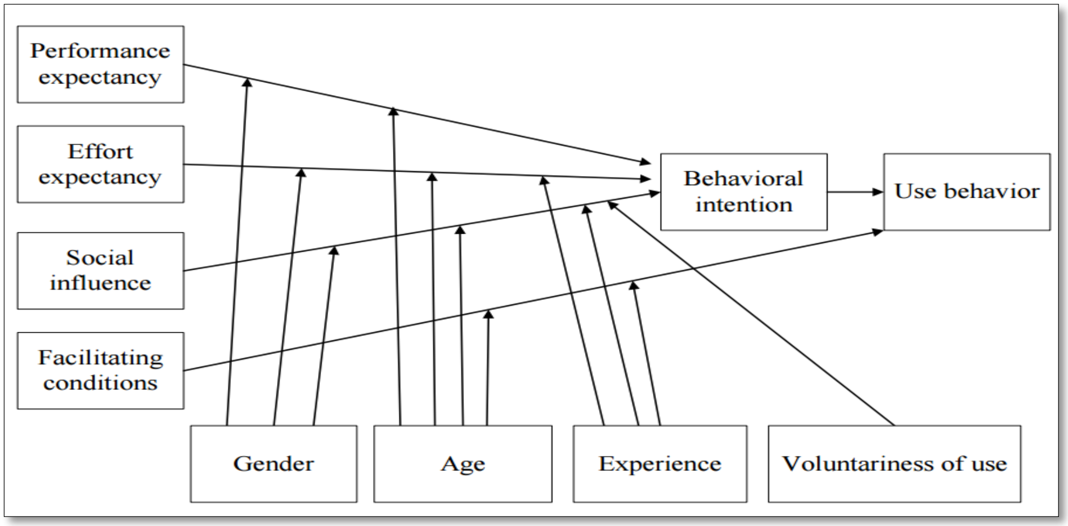

*Figure 11.*Unified theory of acceptance and use of technology (Venkatesh et al., 2003).

Other theoretical frameworks that modify or expand the TAM model include Govender's (2012) TRA wherein perceived use and perceived ease of use drive individuals' attitude towards using technology and can predict their BI to use technology.

To understand the Venkatesh et al.'s (2003) UTAUT model requires explanation of its four constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). Davis' (1989) TAM indicated that for individuals to use new technology, they must believe that it is easy to use or requires little or no effort. Davis explained that "perceived ease of use (PEOU), unlike perceived use transcends work settings as well as goals or purposes" (p. 320). Whereas perceived ease of use or the perception that a system or technology is easy to use which influences a person's behavioral intent to use, effort expectancy in UTAUT is "the degree of ease associated with the use of a system or technology" (Šumak & Šorgo, 2016, p. 605).

In an earlier study, Teo (2009) required preservice teachers in Singapore to "self-report their attitudes toward computer use" (p. 89). Study findings indicated that the participants' "attitude towards computer use was attributed to their perceived usefulness and perceived ease of use, subjective norms, and facilitating conditions" (p. 89). Facilitating conditions are factors that can affect people's decision to complete their tasks and are relevant to material, organizational, and social support (Groves & Zemel, 2000).

Groves and Zemel indicated that support from peers is a crucial and influencing factor that can lead to technology use. Social influence encompasses factors that affect an individual's BI to use new technologies. Venkatesh et al. (2003) explained that individuals consider the opinions of people who are important to them when using or intending to use certain technologies.

UTAUT's dependent variables. The two dependent variables of UTAUT are behavioral intent (BI) and use behavior (UB). In this study, the only dependent variable that will be examined is BI to use collaborative cloud computing for grading and feedback purposes.

Behavioral intent (BI). Behavioral intent is an individual's pre-requisite to deciding to use certain technologies for specific purposes.

Use behavior (UB). Use behavior is an individual's decision to use certain technologies for specific purposes. Use behavior in UTAUT is also the actual adoption or usage of certain technologies (Venkatesh et al., 2013). As discussed in Chapter 1, use behavior as a dependable variable will be excluded in this study.

Elimination of use behavior. Use behavior (UB) is a self-reported construct.

Although the UTAUT model identifies UB as one of the dependent variables measured with FC and BI, this study will be limited to BI to use collaborative cloud computing for grading and feedback purposes as a dependent variable. The decision to eliminate UB as a dependent variable is based on previous studies on self-reported constructs. Paulhus and Vazire (2008) indicated that self-reports or studies on self-reported constructs may be practical and inexpensive but with many disadvantages. The authors explained that credibility and inaccuracy are the primary issues of self-reports because “deception and memory” can generate false self-reports even when the respondents are “doing their best to be forthright and insightful” (p. 228).

Paulhus and Vazire (2008) added that self-reports can also generate bias based on the instrument’s questions. To Paul and Vazire, self-reports are unreliable sources of data because minor changes in how questions are worded or formatted can skew the results. Data acquired from self-reports are at a disadvantage even if they are often used to measure “psychological constructs” (McDonald, 2008, p. 3). My decision to exclude the dependent variable, UB, is primarily based on previous researchers’ concerns on self-reporting methods. Therefore, the focus of this study is on the teachers’ BI to use collaborative cloud computing for grading and feedback purposes.

UTAUT Instrument

The UTAUT survey was found to outperform the other technology acceptance models (Venkatesh et al., 2003; Venkatesh, 2013). The survey questionnaire also contains demographic information which includes moderators: age, gender, experience, and voluntariness of use.

UTAUT's moderators. The moderators of UTAUT are: a) age, b) gender, c) experience, and d) voluntariness of use (Venkatesh et al. 2003). Experience refers to a person's number of years of experience in using similar technology. Voluntariness of use is an individual's decision to use a specific technology even if its use is optional (Khechine et al., 2014).

Age. According to Venkatesh et al. (2003), age is a moderator for technology adoption. Venkatesh et al. explained that young males are more interested in how technology can improve their performance whereas older males and less experienced females are more interested in how easy it is to use such technology. Coffman (2014) added that younger males are more knowledgeable in various technologies than their older male counterparts and are therefore more open to use new technologies.

Gender. Venkatesh and Davis (2000) explained that gender can also drive an individual to adopt technology in a workplace. Older individuals may refuse to try new technologies while younger individuals are more open to trying them out.

Experience. Coffman (2014) explained that users are more likely to use new technologies if they have prior experience using similar or comparable technologies. Individuals are more comfortable with new technologies if they are familiar with how they generally work.

Voluntariness of use (VU). Voluntariness of use is "the degree to which use of the innovation is perceived as being voluntary, or of free will" (Moore & Benbasat, 1991,

p. 195). Individuals are more likely to try new technologies on a voluntary basis.

Research on UTAUT

Studies framed with the UTAUT model include research in the fields of healthcare, business and information systems including online banking, and education. In education, most of the studies framed with the UTAUT model were conducted to examine higher education instructors and students and their BI to use certain technologies. This study is one of the few studies framed with the UTAUT model in K-12 environment. This study will be one of the first studies found in the United States that are framed with the UTAUT model at multiple K-12 public school districts.

Research on UTAUT in healthcare. Healthcare is an “information sensitive” industry (Lubitz & Wickramasinghe, 2006, p. 16). Therefore, transitioning from “platform-centric to a more cohesive and collaborative network-centric operations” is even more critical in all areas of the healthcare industry (Lubitz & Wickramasinghe, 2006, p. 16). The authors added that “while all industries suffer to a greater or lesser degree from the problems brought about by information chaos, healthcare is arguably the most affected” (p. 16).

Telemedicine is an area of the healthcare industry that provides “healthcare over a distance by means of telecommunications technologies” (Whitten, Holtz, & Nguyen, 2010, p. 211). Whitten et al. (2010) indicated that telemedicine has been around for over 50 years but is still considered a new concept until recently due to longer lifespans, rising costs of healthcare, and lack of qualified healthcare workers. The purpose of Whitten et al.'s study (2010) was to "determine organizational characteristics evident in successful telemedicine programs" (p. 211).

The authors aimed to examine the telemedicine programs across the United States to evaluate different stakeholders' perspectives about the adoption and sustainability of telemedicine programs. The participants of the study included managers and supervisors of telemedicine programs who were part of the "American Telemedicine Association" (ATA) network (p. 212). The participants were invited to complete an online survey form. The survey was designed using two theoretical frameworks: Venkatesh et al.'s (2003) UTAUT and the Organizational Readiness for Change (ORC). ORC's constructs include "motivation, resources, employee characteristics, and organizational climate" (Whitten et al., 2010, p. 212). A thirty percent response rate yielded 92 completed survey responses. Pearson correlation results suggested that training (included in FC) was significant when sustaining telemedicine programs for support from healthcare providers (R=0.224 at a .05 level) and when sustaining support from the senior management of the organization (R=0.227 at a .05 level).

The strength of evidence of Whitten et al.'s (2010) study is moderate. The research questions focused on the "organizational design" of the telemedicine programs and the participants' "overall attitudes and perceptions of telemedicine" (Whitten et al., 2010, p. 211). The constructs of ORC were measured and reported extensively but the measurement and reporting of the UTAUT variables were minimal. The research questions, the theoretical frameworks, and the constructs, were not purposely aligned, resulting to significant gaps towards understanding the participants' BI to use telemedicine and BI to sustain the use of telemedicine in future years. The supervisors and managers understood some of the factors that could influence their employees' and staff members' use of telemedicine and evaluated the sustainability of the program. Understanding these factors can help managers and supervisors introduce the concepts of telemedicine and its sustainability to different healthcare employees and staff.

Healthcare stakeholders include doctors, nurses, organizational or institutional staff, patients, patients' family including family caregivers. In Chiu and Eysenbach's (2010) study, the authors conducted a "multiphase, longitudinal research design" consisting of 46 Chinese family caregivers in Canada who were taking care of their family members with Dementia at home. The purpose of the study was to examine the family caregivers' BI to use e-health intervention (p. 1). The two theoretical frameworks applied in this study were Venkatesh et al.'s (2003) UTAUT and Eysenbach's (2005) "Law of Attrition" (LOA) (p. 1). Using UTAUT, the authors were concerned about the perceptions of the family caregivers on the new e-health services which included "supportive interventions to people with chronic diseases" (p. 1.).

The participants were grouped into two categories: a) family caregivers who completed the survey form and gave consent to provide additional data for the remaining phases of the study and b) family caregivers who completed the survey but did not give consent to provide additional data for the remaining phases of the study. Using Eysenbach's (2005) LOA, the authors were concerned about the caregivers' usage of e-health services during the “different stages of care which are: a) consideration, b) initiation, c) utilization, and d) outcome” (p. 1). During the consideration stage, family caregivers started to acquire general information about the e-health systems. During the initiation stage, family caregivers started to use the e-health system.

During the utilization stage, family caregivers actively use the e-health service. The utilization stage is a critical stage when caregivers decided to reject or accept the e-health system. During the outcome stage, family caregivers have made the decision to use or abandon the e-health system. The independent variables for the study included UTAUT’s constructs and the Burden Scale for Family Caregivers (BSFC). Data analyses methods included Chi-square tests and ANOVA. The author performed a test significance and linear regression to identify the variables in univariate analyses before performing a multivariate logistic regression to determine the confounding effects of the variables. Study findings indicated that PE and FC were not statistically significant factors of BI to use e-health systems among family caregivers, however, EE was a statistically significant factor ($p = 0.04$), suggesting that caregivers who decided to stay for the remaining stages of the study perceived e-health service as easy to use.

Venkatesh et al.’s (2003) UTAUT’s PE scores “for both consenting and nonconsenting caregivers were 19.54 and 19.63 respectively, indicating that both consent and nonconsenting participants agreed that the e-health service will be useful to them” (p. 9). The authors added the implication of this finding: “when caregivers are attracted to a service because of its perceived usefulness, it is the non-user-friendly features that stop them from eventually using it" (p. 9). The strength of evidence of this study is high. The research questions were purposely aligned with the theoretical frameworks and their models' constructs. The study's examination of caregivers' BI to use e-health systems contributes to the growing literature on healthcare, this sector's technology use and privacy associated with technology use.

An online survey based on the Venkatesh et al.'s (2003) UTAUT model was "disseminated to Mental Health Counselors (MHC) and Primary Care Psychologists (PCP)" in the Netherlands (p. 1). Van der Vaart, Atema, and Evers' (2016) study aimed to "gain insight into the use of and intention to use online self-management interventions among MHCs and PCPs. According to the authors, although there are higher demands for mental healthcare providers to treat patients with mild to moderate mental health problems, they usually refrain from referring these patients to specialists.

Data analyses include chi-square tests and t-tests. Multiple regression was also performed. There were 481 MHCs and 290 PCPs who completed the online survey. Using Spearman's correlation, study findings indicated that all UTAUT constructs were statistically significant in predicting the participants' BI to use online self-management interventions with PE at 0.86 and 0.88 for MHCs and PCPs respectively, EE at 0.71 and 0.68 for MHCs and PCPs respectively, FC at 0.79 and 0.83 for MHCs and PCPs respectively, and SI at 0.69 and 0.71 for MHCs and PCPs respectively. The strength of evidence in this study is high. The research questions were purposely framed with the constructs of UTAUT. The results confirmed the reliability and validity of the UTAUT instrument. The study is relevant to this study because of its use of the UTAUT model to examine the BI to use an online healthcare service among mental healthcare providers. The results in which all UTAUT constructs were strong predictors of BI to use technology at work were promising not just in healthcare industry but also in education.

The need to examine healthcare providers' BI to use electronic systems was also evaluated in Heselmans et al.'s (2012) study. In this study, "an Evidence-Based Medicine Electronic Decision Support (EBMeDS) was integrated with Electronic Medical Records (EMR) of Belgian family physicians" (p. 3677). The mixed methods study investigated the factors that can influence the adoption of EBMeDS by examining the physicians' file logs extracted from the software program (qualitative) and using structural equation model to analyze the UTAUT and TAM constructs (quantitative). Study findings indicated that perceived use (PU), a TAM construct; like UTAUT's PE and FC were "statistically and significantly correlated with the participants' BI to keep using the system" (Heselmans et al., 2012, p, 3679).

The strength of evidence in this study is moderate. The response rate was significantly low at "39 out of 334 invited family physicians responding" (p. 3679). Heselmans et al. (2012) explained that the study's "results were limited to the perceptions of current EBMeDS and did not include the valid input of physicians who stopped using the system" (p. 3683). In aiming to examine the physicians' BI to use online technologies, the results yielded that 50 percent of the UTAUT constructs were strong predictors of BI to use a specific technology.

Examining how healthcare students interact with technology is also a valuable contribution to the healthcare industry because it provides researchers an overview of how future physicians, nurses, and other healthcare providers intend to use new technologies. In Siracuse and Sowell's (2008) study, the purpose of the study was to "describe the use of personal digital assistants (PDAs) by a group of students in a Doctor of Pharmacy program, to measure the reliability of psychometric constructs, and to determine if these constructs directly correlate with the students' PDA use" (p. 1). Pharmacists and pharmacy students use PDAs to search for drug information.

Participating pharmacy students who were proficient PDA users also used these devices to complete their schoolwork (Siracuse & Sowell, 2008). A total of 265 students participated in this study, however, only 25 of these students considered themselves proficient users of PDAs. Constructs for this study were derived from Davis' TAM and Venkatesh et al.'s (2003) UTAUT models. Study findings indicated that Davis' TAM's perceived use or PU (UTAUT's PU) and TAM's attitude towards use were significant" factors that influenced students' BI intent to use their PDAs. However, there was "no significant relationship between TAM's ease of use (UTAUT's EE) and BI to use PDA" (p. 6). Finally, there was a significant relationship between BI to use PDA and UB, confirming Venkatesh et al.'s study findings that BI has a positive and significant relationship with UB.

The strength of evidence in Siracuse and Sowell's (2008) study is high. The research questions were purposely framed with the constructs selected from two technology acceptance models. However, the percentage of students who were aware of the use of PDAs in their academics or who have used PDAs on a regular basis was extremely low (less than 10%). Since Siracuse and Sowell's (2008) study limited its target population to pharmacy students, determining if practicing pharmacists intend to use this technology is unclear. The study could have yielded more beneficial results if the target population consisted of both practicing pharmacists and student pharmacists.

The use of medical information repositories is categorized in an area of study called Health Information Technology (HIT). Hospitals rely on HIT to store patient information. Patient information repositories should be easy for physicians and staff to access. "If a hospital keeps electronic medical records (EMRs), the underlying health information systems is the primary repository and source of patient-related data for hospital physicians" (Weeger & Gewald, 2015, p. 64). However, in Germany, Weeger and Gewald explained that HIT adoption is slow.

German physicians have negative attitudes towards computerized patient information systems. Weeger and Gewald's study was framed under Davis' (1989) TAM and Venkatesh et al.'s (2003) UTAUT models. The study was conducted on the premise that "physicians' beliefs about technological capabilities are predictive factors of their HIT usage and acceptance behavior" (p. 69). There were 6 research sites in this qualitative study. The study was guided by "semi-structured conversations" (p. 70).

Weeger and Gewald's (2015) study findings indicated that PE was a significant factor in predicting BI to use EMRs among the physicians. To many physicians, EMRs can enhance their productivity levels, a major concern due to high numbers of cases or workloads they must manage. The physicians indicated that EMRs can assist them in performing repetitive and monotonous tasks. EE was a significant factor in predicting UB. The strength of evidence in this study is high, however, its small sample (number undisclosed by the researchers) indicated that the findings "can only be generalizable to some degree" (Weeger and Gewald, 2015, p. 78).

Another emerging technology in the healthcare industry is robotic surgery BenMessaoud, Kharrazi, & MacDorman's, 2011). Robotics surgery can perform complex surgeries such as "laparoscopic surgery" and can enhance "dexterity, accuracy, scalable motions, camera stability, ergonomics, elimination of tremor, depth perception" with better patient outcomes" (BenMessaoud et al, 2011, p. 2). The authors indicated that many surgeons refrain from using robotic surgery in their routine operations. Using Venkatesh et al.'s (2003) UTAUT model, the purpose of the study was to understand the motivations and the challenges faced by surgeons when deciding to use of robotic surgery. BenMessaoud et al. (2011) documented different online comments from surgeons relevant to each UTAUT construct. Study findings indicated that PE is the strongest factor behind the use of robotic surgery and that surgeons considered the enhanced functionalities of robotic surgery as a driving factor to use it (BenMessaoud et al., 2011).

BenMessaoud et al. (2011) also explained that having a technical support representative on site contributed to the surgeons' confidence in robotic surgery. The strength of evidence for this study is moderate. BenMessaoud et al suggested that "the results were limited to one group of stakeholders and did not include the views of the patients, hospitals, and robotic equipment makers" (p. 7). However, the study is relevant to this study because of its use of UTAUT constructs to determine future use of new technologies, in particular, the importance of FC (on-site technical support) in technology use.

The need for an easily accessible, if not, on-site, technical help could also be a major contributor to technology use among K-12 teachers. I have always speculated that teachers feel more comfortable adopting new technologies if they know that technical assistance is on-site or can be requested immediately. Besides technical assistance, K-12 teachers also need support from their administrators and colleagues. This "collegial support is key to creating and sustaining a collaborative environment" (NCES, 1999). NCES indicated that "school administration's responsibility to nurture such an environment" can have a positive impact on the teachers' persistence and "job satisfaction" through "one-on-one support for the teachers."

Patients' use of technology is also important. Diño and Guzman (2015) sought to predict Filipino elderly's BI to use telehealth. Telehealth or "healthcare delivery at a distance" remains underexplored by Filipino elderly individuals (p. 60). The authors used Venkatesh et al.'s (2003) UTAUT model and Rosenstock's (1966) Health Behavior Model (HBM). Using SEM, Diño and Guzman analyzed the relationships of the variables.

There were 82 senior participants in Diño and Guzman's (2015) study. Consistent with Venkatesh et al.'s UTAUT validation, all constructs measured "greater than 0.70 with a significance level of 0.001" (p. 60). Study findings indicated that EE was the most influential factor on the elderly's BI to use telehealth. The authors explained that elderly patients are more likely to use telehealth if they perceive it to be easy to use. PE was also significant in Diño and Guzman's study indicating that elderly patients are more likely to use telehealth if they perceive it as pivotal in achieving and maintaining good health. SI was also a significant factor in this study which also explains the "socioemotional characteristics of the Filipino elderly" (Diño & Guzman, 2015, p. 63). Gender, as a moderator, did not influence the BI to use telehealth among Filipino elderly.

The strength of evidence in Diño and Guzman's (2015) is high. The research questions were purposely framed with UTAUT's constructs; however, the study is limited to a small group of individuals, and therefore, cannot be generalized to a larger population. Also, the cultural differences of Filipino elderly may also differ significantly from the cultures of elderly individuals in the Western hemisphere since SI may have a large influence on Filipino people due to close family ties and extended (non-nuclear) homes.

Social media is another technology that has transformed the way people communicate with each other and the way businesses promote their products and services. In Hanson et al.'s (2011) study, the authors aimed to examine health educators' acceptance and use of social media. The study sample comprised of "503 Certified Health Education Specialists (CHES)" who completed an online survey (p. 197). Regression analysis was utilized to examine the relationships between social media and UTAUT constructs.

Findings in Hanson et al.'s (2011) study indicated that "the highest mean scores for EE among health educators" were in 18-29-year-old participants (p. 200). However, most social networks were blocked at the facility which made it difficult for health educators to use social media to promote good health. FC was also a significant factor in the adoption of social media among health educators. Health educators' support from their managers were found to be critical. The strength of evidence in this study is high and the findings were consistent with other studies framed under the UTAUT model wherein younger end-users attributed EE with their BI to use technology and facilitating conditions was a strong predictor of technology use.

The study is relevant to this study because it sought to discover if health educators were willing to collaborate with their peers online through social media. In this study's literature review on the use of UTAUT to predict BI to use technology or technology adoption in the healthcare industry, 6 of the studies indicated that PE is a strong predictor of BI, 7 of the studies indicated EE as a strong predictor of BI, 2 of the studies indicated that SI is a strong predictor of BI and 5 of the studies indicated FC as a strong predictor of BI (See Table 4).

Table 4

Literature Review on UTAUT Used in Field of Healthcare

Research	Technology	Stakeholders	Significant UTAUT Constructs with BI	Strength of Evidence
Siracruse & Sowell (2008)	PDAs	Pharmacy students	PE	High
Whitten, Holtz, & Nguyen (2010)	Telemedicine	Managers and supervisors	FC	Moderate
Chiu & Eysenbach (2010)	e-health intervention	Chinese family caregivers in Canada	PE and EE	High
BenMessaoud, Kharrazi, & MacDorman (2011)	robotic surgery	Surgeons	FC	Moderate
Hanson et al. (2011)	social media	Certified health education specialists	EE, FC	High
Heselman et al. (2012)	electronic decision support system	Belgian family physicians	PE, FC	Moderate
Weeger & Gewald (2015)	electronic medical records	German physicians	PE, EE	High
Diño & Guzman (2015)	Telehealth	Filipino elderly patients	PE, EE	High
Van der Vaart, Atema, & Evers (2016)	online self-management intervention	Dutch mental health practitioners	PE, EE, SI, FC	High

Note. Studies in United States include Siracruse & Sowell (2008), Whitten et al. (2010), BenMessaoud et al. (2011), Hanson et al. (2011).

Research on UTAUT in business and information systems (IS). Businesses rely on technology for production, distribution and transport, advertising and branding, sales, marketing and customer service, human resources, security, data analysis, finance, and other sectors to do things and to enhance consumer experiences. Deng, Liu, and Qi's (2011) study aimed to "identify the driving factors of web-based question-answer services (WBQAS) adoption" (p. 789). WBQAS is an online forum that allows consumers to post online questions and to respond to each other's posts. "Virtual rewards" are given to consumers who have correctly answered other consumers' questions. Virtual rewards are indicators of good online reputation. Consumers also get physical rewards including "prepaid phone cards" (p. 789). "ChinaRank," is an example of a WBQAS for Chinese consumers to rate certain website traffic (p. 789). Deng, Liu, and Qi's (2011) study was framed with Venkatesh et al.'s (2003) UTAUT framework. The study utilized a survey design sent out to a university forum. The study was comprised of college student participants and yielded 169 completed responses. SEM was used to assess the model.

Study findings indicated that UTAUT's PE and EE were significant factors that can predict the participants' BI to use WBQAS. FC was a strong predictor of WBQAS usage. However, SI was not a significant predictor of BI and UB. The authors suggested that the "the use of WBQAS tends to be a more personal issue and might not be an effective strategy for practitioners to use when advertising with WBQAS to generate more users" (p. 796). The strength of evidence in this study is moderate. The authors examined issues relevant to the topic. The research questions, hypotheses, and constructs were purposely aligned. A systematic literature review was provided but the authors did not explain the steps taken to minimize bias. The study is relevant to this study because it utilized the UTAUT framework and confirmed Venkatesh et al.'s (2003) UTAUT findings. One limitation for this study was that it cannot be generalized to a larger population. The study was limited to Chinese college students with different cultural backgrounds, motivations, and expectations. However, the study can be replicated by targeting other sample populations including consumers outside of the university setting.

Websites have become a vital venue for advertising in any business. Websites provide a voice for businesses and this voice can be heard from any part of the world. The availability of mobile phones has made it crucial for businesses to have websites that are mobile friendly or have responsive web designs. "The goal of responsive web designs is to make a web page look equally good regardless of the screen size of a device" allowing texts, graphics, and videos to be readable in smaller devices including mobile phones and tablets (Kim, 2013).

Wang and Wang (2010) explained that "mobile activities or "m-internet" basically denote any electronic activities performed in a wireless environment through a mobile device and via the Internet" (pp. 416-417). Guided by Venkatesh et al.'s (2003) UTAUT model, Wang and Wang aimed to determine consumers' BI to use m-Internet. The constructs of this study encompassed UTAUT's constructs with perceived playfulness, perceived value, and palm-sized computer self-efficacy. A total of 343 Taiwanese consumers volunteered for the study.

Study findings indicated that PE, EE, and SI were strong predictors of BI to use m-Internet. Perceived playfulness had no significant correlation with BI to use m-Internet, however, perceived value and an individual's self-efficacy in using palm-sized devices were strong predictors of BI to use m-Internet (Wang & Wang, 2010). It is unclear if age was a significant moderator for the use of palm-sized devices.

The strength of evidence in this study is low. The association between the research questions, hypotheses, and the constructs were purposely aligned, however, there were items that were missing. For example, the study did not specify the steps taken to avoid bias. The authors also did not specify methods for data collection and the limitations of the study. The respondents' characteristics and profiles were not clearly identified which resulted to missing pertinent demographics information such as age and gender that could have affected the variables in this study.

Venkatesh et al.'s (2003) UTAUT model and survey questions have been adopted by various researchers outside of the United States. Venkatesh and Zhang (2010) aimed to "enrich people's understanding of research on technology adoption by examining a potential boundary condition related to the culture of the fairly recently developed model of technology adoption, UTAUT, and technology use" (p. 5). In this study, the authors "contextualized UTAUT for China as a country of comparison" (p. 6). The authors aimed to compare the use of UTAUT in the United States to the use of UTAUT in China.

The decision to compare the use of UTAUT in China and in the United States was grounded on two reasons. First, the culture in China differs substantially with the

American culture in terms of beliefs, perceptions, and attitudes towards technology. Therefore, the roles of gender, age, and voluntariness may also be different. Second, China is also characterized by its collectivist culture and behavior whereas the United States is characterized by its individualistic culture and behavior. The participants in Venkatesh and Zhang's (2010) study were knowledgeable professionals who worked in the business sectors of both China and the United States.

The study was comprised of 201 Chinese employees and 149 American employees. Partial least squares (PLS) was used to "analyze the measurement properties of the constructs including estimation of internal consistency, convergent, and discriminant validity of the scales" (Venkatesh & Zhang, 2010, p. 14). The results indicated what the authors theorized. In China, the relationship between PE and BI was moderated by gender and age; the relationship between EE and BI was also moderated by age, gender, and experience. However, the relationship between SI and BI were not moderated by age, gender, and experience.

The differences between Chinese and American people's BI to use technology can be attributed to their cultural differences. SI was also a significant factor that influenced BI to use and UB towards technology in China. The strength of evidence in this study is high. The study did not contain conflicting findings on the determinants of BI to use and UB towards technology among U.S. consumers. The association between the research questions, hypotheses, and the constructs were purposely aligned. The authors explained the steps taken to minimize bias. The study is relevant to this study.

The microcosm of U.S. public education encompasses the different backgrounds and cultural characteristics of K-12 teachers. Although some teachers may come from a collectivist culture, most of the American teachers have individualistic attitudes.

Introducing new technologies at a workplace is critical and should be done with SI in mind. In Eckhardt et al.'s (2009) study, the authors aimed to examine the role of SI on BI to adopt technology among different "workplace referent groups including superiors and colleagues from an IT department" (p. 11). The authors used Venkatesh et al.'s (2003) UTAUT model with the "reconceptualized social influence integrated into the research model" (p. 14). The technology for this study was the "CV database" (p. 15). The study was comprised of IT department superiors and colleagues employed at different corporate recruiting firms who managed job boards including "CareerBuilder and SnagAJob.com" (p. 15). The study used printed survey questionnaires and employed the PLS method to analyze the data.

Findings in Eckhardt et al.'s (2009) study indicated that SI had the "strongest impact" on the superiors' BI to use technology but also had the "weakest impact" on the IT department colleagues (p. 21). SI also differed between the CV database nonadopters and adopters. Members of the IT department's SI was significant to nonadopters but not to the adopters. The strength of evidence in this study is high. The study did not contain conflicting findings, but it generated new findings on SI construct of Venkatesh et al.'s (2003) UTAUT model. The study was a unique contribution to the growing literature on the use of UTAUT to determine BI to use technology. The research questions, hypotheses, and the constructs were purposely framed.

Although the authors did not identify steps taken to avoid bias, steps were taken to ensure the reliability and the validity of the UTAUT model and the survey questionnaire. The microcosm of K-12 environment also consists of superiors (administrators) and the teachers (colleagues). Understanding how the teachers' SI can help predict their BI to use cloud computing for grading and feedback purposes is an important contribution to the growing literature on UTAUT in education.

Quality assurance is an important aspect in any business. In Curtis and Payne's (2014) study, the authors aimed to "examine whether the well-established UTAUT and use of technology can be effectively adapted for use in an external audit setting and whether the re-specified model holds under different levels of budget pressure" (p. 304). The authors indicated a reluctance in using technology in the auditing sector of the business. However, the authors explained that due to budget constraints, BI to use and UB towards technology in auditing must be examined.

Curtis and Payne's (2014) study was comprised of 75 auditors who held leadership positions at a large accounting firm. The authors used a "single-period experimental design" to determine BI to use Computer-Aided Audit Tools (CAAT) among auditors. The validity of the instrument was tested with CFA. Data analyses was performed with Pearson correlation. Hypotheses relations were tested through path analyses. Test of research questions were tested using ordinal least regression (OLR). Study findings indicated that PE was the most significant determinant of BI to use

CAAT. However, PE was strongly correlated with SI instead of EE as hypothesized. Age and gender were also strong moderators between FC and PE.

The strength of evidence in this study is high. Findings contradicted some of Venkatesh et al.'s (2003) UTAUT findings due to the nature of the study and the complexity in the day-to-day operations of auditors but the research questions, hypotheses, and the constructs were purposely aligned. The authors took the necessary steps to minimize bias, however, the study was limited to just one accounting firm which weakened its generalizability to a larger population. The study is relevant to this study because of its application of the UTAUT model to understand auditors' BI to use complex technology such as CAAT.

An Enterprise Resource Planning (ERP) system "combines methodologies with software and hardware components to integrate numerous critical back-office functions across a company" (Fillion, Braham, & Ekionea, 2011, p. 2). The system is comprised of modules that connect different applications through a database while connecting different organizational departments to facilitate seamless collaboration. Fillion, Braham, and Ekionea (2011) aimed to determine the factors that influence middle managers and end users to use an ERP system in medium to large enterprises in Canada. Directors from 6 enterprises participated in the study. The authors employed PLS to test the hypotheses and SEM to analyze the data. Study findings indicated that FC was a significant construct with a t-value of 1.597 ($p < 0.05$) showing a positive effect on BI to use the ERP system.

Fillion, Braham, and Ekionea (2011) indicated that a meta analyses of over 100 studies attributed their hypothesis to be true. Study findings also indicated that anxiety, which was not part of the UTAUT model, had a negative effect on BI to use ERP. Age was also a strong moderator of BI to use ERP, a finding that is consistent with the Venkatesh et al.'s (2003) UTAUT model. The strength of evidence in Fillion, et al.'s (2011) study is high as the authors examined issues relevant to this study. The research questions, hypotheses, and the constructs were purposely aligned, and the authors took steps to minimize bias.

UTAUT was applied to studies related to business and IS. Four out six studies reviewed indicated PE as a positive and significant determinant of BI to use technology, three of the studies indicated that EE was a positive and significant determinant of BI to use technology, one study indicated FC as a positive and significant determinant of BI to use, and one study reported SI as a positive and significant determinant of BI to use technology among high ranking employees only (See Table 5). UTAUT has also been applied to several studies on another sector within business and IS: online banking.

Table 5

Synthesis of Primary Research on UTAUT in Business and Information Systems

Study	Technology	Users	Most Positive and Significant UTAUT Constructs	Strength of Evidence
Deng, Liu, & Qi (2011)	Web-based Q&A Services (WBQAS) m-internet	Chinese students	PE and EE	Moderate
Wang & Wang (2010)		Taiwanese consumers	PE and EE	Low
Venkatesh & Zhang (2010)	N.A.	Comparison of Chinese and American employees	Chinese: PE, EE, and SI, U.S.: PE, EE	High
Eckhardt, Laumer, & Weitzel (2009)	CV databases for job boards	European IT Superiors and Colleagues	Superiors: SI, but SI is the weakest in Colleagues	High
Curtis & Payne (2014)	Computer-Aided Audit Tools (CAAT)	Auditors	PE	High
Fillion, Braham, & Ekionea (2011)	Enterprise Resource Planning	Canadian middle managers and end-users	FC	High

Note. Studies in United States: Venkatesh & Zhang (2010) and Curtis & Payne (2014).

UTAUT and online banking. Many studies pertaining to online banking were framed with the UTAUT model. Online banking has revolutionized the way individuals and organizations manage their finances and investments. Determining the factors that influence stakeholders to use online banking is critical for its mass dissemination in Sub-Saharan African countries (Mbrokoh, 2016). Mbrokoh (2016) investigated the determinants of online banking in Ghana. Besides investigating Venkatesh et al.'s (2003)

UTAUT constructs, Mbrokoh also investigated the consumers' perceived credibility towards using online banking. Venkatesh' UTAUT and Davis' (1989) TAM model were integrated to create a survey. A total of 317 completed surveys out of 350 distributed surveys were received. The participants in this study were highly educated consumers with over 80 percent holding a college degree.

SEM was performed to validate the UTAUT model and CFA was performed to test the model fitness and the construct validity (Mbrokoh, 2016). Study findings indicated that PE was a significant predictor of BI to use online banking among Ghana professionals. Consumers who perceived online banking as a method to enhance their banking experience (saving time and effort) were found to be more likely to use online banking. EE was also a significant predictor of BI to use of online banking indicating that consumers who perceived online banking as easy to use were more likely to use online banking in the future.

Mbrokoh (2016) suggested that consumers who intended to use online banking relied on the user-friendly features of the system, the consumers' familiarity of the tasks, and the system's clear instructions. SI was also a positive predictor of BI to use online banking indicating that consumers generally put high regards on their friends' opinions, however, FC was not a positive or significant predictor of online banking use indicating that the participants' environment had no effect on their use of internet banking (Mbrokoh, 2016).

The strength of evidence for Mbrokoh's (2016) is high as the hypotheses and research questions were aligned with all the constructs of two technology acceptance models used, however, the author indicated that the sample population and the context of online behavior were some of the study's limitations. Mbrokoh posited that technology adoption is a complex issue in developing countries. Mbrokoh's study is relevant to this study because of its use of UTAUT and its constructs in determining the participants' BI to use online banking. Mbrokoh (2016) confirmed Venkatesh et al.'s (2003) findings that all three constructs: PE, EE, and SI are strong predictors of BI to use online banking.

In India, Saibaba and Murthy (2013) conducted a study using Venkatesh et al.'s (2003) UTAUT model to determine if consumers from 5 banking institutions intend to use online banking. Survey questionnaires were administered. A response rate of 65% or 325 completed questionnaires were received for data analyses. Exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and SEM were performed (Saibaba & Murthy, 2013). Study findings indicated that UTAUT's PE and EE were strong indicators of consumers' BI to use India's online banking services.

SI and FC were not included in the study. Trust, and attitude were also strong predictors of using online banking. The strength of evidence in this study is high since all research questions were purposely framed with two UTAUT constructs and with trust and attitude. Saibaba and Murthy's (2013) study is relevant to this study because of its focus on consumers' BI to use certain technologies. However, the sample population was part of a small niche of consumers in developing countries and cannot be generalized in similar studies.

In Jordan, AbuShanab and Pearson (2007) aimed to conduct a study to determine Jordanian people's BI to use online banking with Venkatesh et al.'s (2003) UTAUT model. The study also developed an Arabic UTAUT questionnaire which were distributed to three Jordanian banks. A total of 878 completed surveys were inspected for multiple regression. A factorial analysis was performed to test reliability. The strongest predictor of online banking use among Jordanian consumers was PE. EE and SI were also strong predictors of online banking usage. Age and gender were strong moderators, but experience had no effect on the relationships between PE, EE, SI, and UB.

The strength of evidence for AbuShanab and Pearson's (2007) is high. The hypotheses and research questions were purposely framed and aligned with the constructs measured and the study is relevant to this study because of its use of UTAUT model to predict the consumers' use of certain technology. However, the study had its limitations. FC was not included and therefore, it is unclear if technical support available to consumers would have a significant relationship with BI to use online banking. As the authors indicated, BI is a critical construct to investigate in online banking and just as important as UB. Finally, the study cannot be generalized due to its application to a small population of Jordanian consumers.

Online banking includes mobile banking in which consumers can use their mobile phones and tablets to access and manage their financial data. In Yu's (2012) study, there were 441 participants who completed the Venkatesh et al.'s (2003) UTAUT survey. The study was conducted in Taiwan. The survey instrument integrated the constructs of

Venkatesh et al.'s UTAUT, Davis' (1989) TAM model, motivational model, and Bandura's (1988) SCT. PLS was performed. Yu's (2012) findings indicated that PE, SI, perceived financial cost, and perceived credibility can influence the consumers' BI to use mobile banking and UB.

Yu (2012) explained that UB was impacted by BI to use mobile banking. The strongest predictor of BI to use mobile banking among Taiwanese consumers was SI, indicating that Taiwanese consumers are highly influenced by their peers and their peers' technology recommendations. Age and gender were strong moderators of FC and perceived self-efficacy (Yu, 2012). The strength of evidence of this study is high as all hypotheses and research questions were purposely aligned with the theoretical frameworks used and their corresponding constructs. The study is relevant to this study because of its use of Venkatesh et al.'s (2003) UTAUT model to predict use of mobile banking among Taiwanese consumers. However, this study cannot be generalized as it only measures the perceptions of a niche group.

Mobile banking for the millennials (particularly, Generation Y consumers) was also the technology of emphasis in Tan and Lau's (2015) study which was conducted in Malaysia. Tan and Lau aimed to determine if Generation Y college students intend to use mobile banking systems. Multiple regression was employed to determine that PE was the strongest predictor of mobile banking among Malaysia's millennials. Venkatesh et al.'s (2003) UTAUT model was used in this study to determine if its constructs are strong predictors of BI to use mobile banking and UB. Pearson correlation was used to examine the relationships between the UTAUT predictor and criterion variables. Tan and Lau's (2015) findings indicated that EE was the strongest predictor of BI to use mobile banking among Taiwanese Generation Y college students followed by PE. This finding indicated that young people are more likely to use new technologies if they perceive them as easy to use and something that can improve their performance.

Tan and Lau's (2015) study also suggested that bank transactions should be concise. The authors also posited that to meet the millennials' needs in terms of mobile banking acceptance, banks should refrain from using small screens to resolve for data input. Study findings did not contain conflicting results and the authors' research questions, hypotheses, and the constructs were purposely aligned. The authors took steps to minimize bias. The study is relevant to this study because of its use of Venkatesh et al.'s (2003) UTAUT model to predict mobile banking use among Generation Y consumers in Malaysia. However, this study cannot be generalized as it only examined the perceptions of a generational group in Malaysia.

In Spain, the purpose of Martinez-Caro, Cepeda-Carrion, and Cegarra-Navarro's (2013) study was to investigate which Venkatesh et al.'s (2003) UTAUT constructs are strong predictors of usage of "business e-loyalty towards online banking services" from 87 organizations "who used an automated communication channel (called Editran) (p. 404). Smart PLS was used to determine relationships between the variables. Study findings indicated that PE, EE, and SI were strong indicators of UB, however, FC was not a significant predictor. The most significant UTAUT construct in Martinez-Caro et al.'s (2013) study was PE. The strength of evidence of this study is high as all hypotheses and research questions were purposely aligned with UTAUT's constructs. The study is relevant to this study because of its use of UTAUT model to predict usage of business e-loyalty systems towards online banking among Spanish consumers. However, this study cannot be generalized as it only measures the constructs among a niche group. Based on the primary research on the use of UTAUT in the field of online banking, 5 out of 6 studies indicated that PE was a strong predictor of BI to uses online banking, the same 5 studies also indicated that EE was also strong predictor of BI, 1 out of 6 studies indicated that SI was a strong predictor of BI and 1 out of 6 studies indicated that FC was a strong predictor of BI to use online banking (See Table 6).

Table 6

Synthesis of Primary Research on UTAUT in Online Banking

Researchers	Location	Most Positive and Significant UTAUT Constructs	Strength of Evidence
Mbrokoh (2016)	Ghana	PE, EE, SI	High
Saibaba & Murthy (2013)	India	PE, EE	High
AbuShanab & Pearson (2007)	Jordan	PE, EE	High
Yu (2012)	Taiwan	SI	High
Tan & Lau (2015)	Malaysia	PE, EE	High
Martinez-Caro, Cepeda-Carrion, & Cegarra-Navarro (2013)	Spain (e-loyalty online banking)	PE, EE, SI	High

Note. Except for Tan & Lau's (2015) study which consisted of Generation Y college students, participants in these studies consisted of general consumers.

Research on UTAUT and education. Studies consisting of preservice teachers can help shape the way educational researchers and administrators introduce new technologies to practicing teachers. Birch (2003) conducted a study to examine if Venkatesh et al.'s (2003) UTAUT constructs are strong predictors of preservice teachers' acceptance of ICT. Study findings indicated that PE was significantly correlated with BI, EE had the highest correlation with BI and that age and gender are significant moderators for PE, EE, and BI. FC also had a significant correlation with BI. However, SI did not have a significant effect on BI when moderated by age and gender.

Age was a significant moderator in Birch's (2003) study. Supporting Venkatesh et al.'s (2003) UTAUT model, Birch indicated that as age increases, BI to use ICT decreases. However, the author explained that preservice teachers' BI to use technology can change after acquiring permanent teaching positions as they get acclimated with specific ICT applications. The strength of evidence in this study is high as proper steps were taken to ensure the reliability of the instrument. Cronbach's alpha was calculated to determine the reliability of the items for each of the UTAUT constructs (Birch, 2003). PE, EE, and BI items were retained.

The sample size for Birch's (2003) study was also sufficient. "Using a power of .80, alpha of .05, and a large effect size (with 19 interactions), a sample size of 96 was determined to be desirable" (Birch, 2003, p. 40). There were 82 completed surveys collected. Since this study is a mixed methods study, Birch also provided detailed information from the two focus group interviews. Qualitative data for this study included personal interactions with selected participants. Proper steps were taken to record the participants' responses including the use of digital recorder and notes.

Macharia (2011) conducted a study to "provide the management and sponsors of universities and the sponsors of e-learning projects with a clearer understanding of faculty perceptions and their BI, as well as the variables that affect the adoption of e-learning" (p. 6). The study was founded on the premise that schools are always under pressure to use technologies for teaching and learning and the decision to adopt these technologies depends on the funds from different government agencies (Mackeogh & Fox, 2009). Study findings indicated a significant positive correlation between PE and BI to adopt e-learning; a significant positive correlation existed between EE and BI to adopt e-learning, and a significant positive correlation was found between SI and BI to adopt e-learning (Macharia, 2011). SI was a positive significant predictor of BI and VU was a strong moderator for SI and BI (Macharia, 2011).

However, age did not moderate PE but moderated EE and SI, and gender moderated EE and SI but it did not moderate PE (Macharia, 2011). Computer self-efficacy moderated EE but experience did not moderate both PE and EE (Macharia, 2011). The strength of evidence in this study is high as the "instruments that largely utilize the TAM and UTAUT models had an average convergent validity of 0.70, and discriminant validity for perceived usefulness, perceived ease of use and social norm of 0.72, 0.67 and 0.80 respectively" (Macharia, 2011, p. 92). Using the Mark to Matrix (MTM) matrix, study findings indicated that the traits emerging out of TAM's perceived use and perceived ease of use were significantly high at $p < 0.05$ while the remaining traits were correlated with each other.

When Venkatesh et al. (2003) tested the validity of the UTAUT instrument, a Cronbach's alpha value of 0.70 was generated confirming its scale reliability and internal consistency. Data analyses for Venkatesh et al.'s study included descriptive and inferential statistics, and PLS. Pearson correlation was performed to determine relationships between the predictor variables and the criterion variables. The sample size of the study was sufficient with 162 completed responses. Replicating Venkatesh et al.'s (2003) study, Birch and Irvine's (2009) study was conducted in Canada to determine the role of UTAUT in the preservice teachers' acceptance of ICT. According to Birch and Irvine, Ontario Ministry of Education encourages the use of ICT. However, the acceptance of ICT yields different rates of acceptance across the country.

Birch and Irvine (2009) performed a multiple regression to examine PE, EE, SI, FC, BI and UB with the moderators of gender, age, experience, and VU. This mixed methods study consisted of secondary preservice teachers in a Canadian university. All four variables, PE, EE, SI, and FC yielded positive impacts on the participants' BI to use ICT and UB with EE as the strongest predictor when moderated by experience. VU was not a significant moderator. The strength of evidence of this study is high as all UTAUT variables were used as originally designed by Venkatesh et al. (2003) and no new variables or moderators were introduced making the study replicable. Birch and Irvine (2009) examined the results and carefully posited possible reasons and possible solutions to increase the impact of each independent variable and moderators.

The proliferation of technology adoption is attributed to the instructor's use of web-based applications and tablets such as iPads. Melocchi (2014) conducted a study on the premise that instructors are perceived to be the main performers in ensuring that learning is attributed to technology and in ensuring that students are positively influenced by technology. Zhao and Cziko (2001) explained that teachers play a pivotal role in the "effective use of technology devices in the educational system" (p. 3).

With UTAUT as its theoretical framework, the purpose of Melocchi's (2014) study was to "examine the acceptance of iPad technologies by faculty members toward the perceived improvement in student retention rates" (p. 6). Melocchi employed a survey design, distributing electronic surveys to 395 faculty members and receiving 195 completed surveys. The findings of the study indicated that perceived improvement and actual use of iPads in classroom activities and perceived improvement and student retention are positively correlated. The strength of evidence in Melocchi's study is high. Cronbach's alpha was performed to test the reliability and internal validity of the instrument although the author cited other studies to ensure instrument and face validity of the model which include (Lai, Lai, and Jordan (2009); Marchewka & Liu (2007); Pardamean & Susanton (2012); Venkatesh, (2003, p. 62).

Williams (2015) explained that school administrators must understand their teachers' characteristics to successfully increase technology use. Williams' purpose was to examine the relationships between technology acceptance constructs and technology use of various applications among faculty members at different postsecondary schools. Technology applications include PowerPoint slide presentations, Keynote Presentations, and Google Slides. A total of 39 applications and 40 devices were introduced in this study. A seven item Likert scale questionnaire on the participants' PE, EE, SI, FC, BI and UB was distributed.

Williams' (2015) study findings indicated that instructors perceive technology use as a positive contributor to their teaching performance. Williams interpreted this finding from a score of 23.92 for PE. Instructors also agreed that learning new technology is easy. The author interpreted this finding from a score of 26 for EE. The instructors also agreed that people who are important to them recommend the use of technology in their classrooms. Williams interpreted this finding from a score of 24 for SI. Finally, the instructors somewhat agreed that they have the resources and support they need to use technology in their classrooms. Williams interpreted this finding from a score of 0.22 for FC.

The strength of evidence in this study is low. The recommended sample size of 106 was not met. The number of completed responses collected was 65. An insufficient sample size on a study that aims to generalize the perceptions of higher education instructors on specific technologies can only yield inconsistent results and therefore will not contribute empirically to the growing literature that focuses on UTAUT in the field of education. Second, testing the UTAUT model on 30 applications and 40 devices was not the best or realistic approach. A selection of 2 or 3 devices or applications should suffice the integrity of the data collected in this study. Finally, the author did not test the moderators of the UTAUT model.

Another study utilizing the UTAUT model in higher education was Mtebe and Raisamo's (2014) study. This study was conducted outside of United States wherein the participants consisted of 104 instructors in Tanzania with 15% female and 75% male, who were randomly selected. The authors' objective was to "elicit instructors' intention to adopt and use Open Educational Resources (OER) in teaching" (p. 249). A major concern in Tanzania was that institutions "have been spending considerable amount of resources to procure, install, and maintain various ICT equipment to complement face-to-face delivery" (Mtebe & Raisamo, 2014, p. 250). However, only 21.8% of the 150 respondents in this study were aware of the university's free resources for hybrid education (p. 250).

CFA was employed with direct oblimin rotation wherein five factors loaded successfully in a pattern matrix table. Regression analysis was performed to determine predictors of BI to use and UB towards OER. Study findings indicated that PE, SI, and FC were not strong predictors of BI to use and UB towards OER. The challenge in this study was that many instructors were not aware of the availability of OER.

The lack of awareness about intellectual property and copyright policies and guidelines can be resolved. As the instructors gain experience with using OER, the adoption of such technology can increase over time. The study cited Venkatesh et al.'s (2003) emphasis on the importance of practice or exposure to specific technologies which will change the perceptions of the users over time, giving them more confidence to use these technologies in the future. The strength of evidence in this study is low. Although the authors were self-critical and indicated the limitations of this study including its cultural differences, the study's literature review was insufficient.

Using the UTAUT model to understand technology acceptance among instructors is worthwhile because mixed findings continue to emerge from different studies. The complexity of technology adoption among instructors is due to the many factors involved during the process. For example, Anderson, Schwager, and Kerns' (2006) study yielded mixed results wherein "PE yielded positive results with a significant path coefficient (*ß* = 0.466, t = 2.6569, $p < .01$) while EE's path coefficient was not significant (*ß*= 0.205, t = 1.1064); SI's path coefficient was not significant (*ß* = 0.044, t = 0.1779), and FC's path coefficient was not significant (*ß* = 0.046, t = 0.2092)" (p. 429). In this study, Microsoft tablet PC's were introduced to the faculty members of university's college of business in the United States. The authors posited that faculty members, with the use of tablet PC's, can focus more on their students' needs.

Anderson et al.'s (2006) purpose was to acquire data that can explain if the faculty members of the college of business are likely to accept and use tablet PC's. To explain the negative impact of EE with the use of PC tablets, the authors suggested that university instructors are more "results oriented" and are "willing to invest time to learn a new technology if it will produce results" (p. 436). The authors attributed the insignificance of SI to the fact that technology use in this study was voluntary, a confirmation of the original UTAUT, as explained by the authors stating that "voluntariness is a strong coefficient, so the more voluntary faculty believe the use of a technology to be, the more they use it" (p. 437). Furthermore, with FC, the authors explained that:

> Facilitating conditions was not measurably significant in this new technology introduction. It could be indicative of the expectations faculty have, based on prior experience, that knowledgeable and supportive personnel will be present in any new technology introduction. (p. 437)

Using an email survey, Anderson, Schwager, and Kerns' (2006) study consisted of 37 respondents which yielded a high response rate of 74%. PLS, PLS Graph, and Smart PLS were employed. In examining the moderators, gender cannot be examined because there were only 5 female participants. Age was not significant to BI and UB. Experience also yielded no significant impact. VU impacted BI and UB, which the authors posited as consistent with Venkatesh et al.'s (2003) study.

The strength of evidence of Anderson, Schwager, and Kerns' (2006) study is high. The authors identified the study's limitations including having only 5 female participants. This large variance between male and female respondents can be expected in a specific university department wherein males still dominated certain professions.

A majority of the studies utilizing UTAUT in education were conducted in higher education. Therefore, a significant contribution of this study is to apply UTAUT to K-12 education while understanding the complex factors of technology adoption among the teachers. Many K-12 schools in the United States have wireless technology so both teachers and students can utilize their devices in the classrooms.

In McCombs' (2011) study, the BI of high school teachers to integrate technology into their classrooms at a private school were examined. The study was founded on the premise that private schools in the country "experienced a growth in technology development" (McCombs, 2011, p. 2). This technology growth contributed to teachers' and students' access to different technology applications, but some challenges need to be overcome with new technological developments such as the pressure brought on to the teachers to decide which technologies they should use in their classrooms (McCombs, 2011).

McCombs' (2011) study examined the factors that can influence high school teachers' implementation of technology into their curriculum. The study investigated the factors that influence teachers' BI to "develop curriculum activities that require students to use technology" (p. 8). Study findings on the construct EE indicated:

> In the path analysis of the present study, effort expectancy (β=0.667) proved to have the second strongest effect on behavioral intention, accounting for 45% of the variance in behavioral intention (R^2 =.45), and in the factor analysis, effort expectancy (α=.83) was considered a strong factor as all six items had factor structure coefficients above 0.5 (Stevens, 2002). The relationship between effort expectancy and behavioral intention was a positive value. (p. 140)

McCombs' (2011) findings indicated that as PE increases, BI to use the technology increases. An additional construct in this study, anxiety, also proved to be a strong predictor of BI (McCombs, 2011, p. 141). PE was a moderate predictor of BI which indicated that technology must correspond with the "teacher's instructional goals" (p. 142). SI was also a moderate predictor of BI.

Self-efficacy was a moderate factor of BI (McCombs, 2011). Although FC had no effect on BI, it had a positive influence on UB. UTAUT moderators did not impact these relationships. The strength of evidence in this study is high since it consisted of well-defined methods to ensure validity and reliability of the model and the model's constructs and additional constructs in this study. McCombs' (2011) study had a sufficient sample size of 251 teachers, meeting the minimum sample size of 160. The literature review articles were relevant and clearly indicated the need for a future study on UTAUT in K-12 classrooms.

Higher Education libraries implement technology to provide services for their students (Awwad & Al-Majali, 2015). The purpose of Awwad and Al-Majali's study was to determine the factors that influence the BI to use and UB towards online library services of students at 6 Jordanian universities and to determine if age, gender, experience, years of education, and academic discipline are strong moderators for the students' BI to use and UB towards online library services. A sample of 575 students were required to complete the surveys.

SEM was used to analyze the data. Awwad and Majali's (2015) findings indicated that PE, EE, and SI were strong predictors of BI to use online library services, and FC had a strong relationship with both BI to use and UB towards online library services. A strong predictor of BI to use online library services among undergraduate Social Science students in the age range of 18-22 was PE whereas EE was the strong predictor of BI to use online library services among older students. Awwad and Al-Majali's study findings also indicated that FC was a strong positive predictor of UB among the students regardless of their age and area of discipline which indicated that students are more likely to use their online libraries if they perceive that enough support and resources are available to them.

The strength of evidence in Awwad and Al-Majali's (2015) study is high. The study consisted of well-defined methods to ensure validity and reliability of the model and the model's constructs and additional constructs in this study. The study had a sufficient sample size of 590, an 82% response rate. Steps were taken to ensure the reliability and validity of the instrument. Also, the study findings confirmed Venkatesh et al.'s (2003) UTAUT findings wherein PE, EE, SI, and FC were strong predictors of BI to use technology, and FC and BI were strong predictors of UB. Measures were taken to avoid bias and to ensure content and measurement validity and reliability. However, the study was limited to 6 Arab university environments and cannot be applied to other populations with different cultural backgrounds. The study is relevant to this study because of its application of the Venkatesh et al.'s (2003) UTAUT model.

Tibendarana and Ogao (2010) conducted a study comprised of 445 end users from 8 Ugandan universities. The study applied the UTAUT model and constructs to determine the factors that influence BI to use and use of hybrid library services. A purposive, stratified, and random sampling method with cross sectional survey was employed. Study findings indicated SI and FC as strong predictors of BI to use hybrid library services. The authors attributed the results to the importance of social connections in Uganda. Like Awwad and Al-Majali's (2015) study, the availability of resources (FC) was a major concern among the university library end users in Tibendarana and Ogao's study. However, PE had a negative impact on BI.

The strength of evidence in this study is high. Study findings confirmed Venkatesh et al.'s (2003) UTAUT study wherein both SI and FC were positive predictors of BI to use technology and wherein FC was a strong predictor of UB. Measures were taken to avoid bias and to ensure content and measurement validity and reliability, however, the study was limited to 8 Ugandan university environments and cannot be applied to other populations with different cultural backgrounds.

Table 7 synthesizes the results of the UTAUT studies on education. Venkatesh et al. (2003) confirmed that UTAUT has a 70% accuracy rate in predicting intent and adoption of technology. Venkatesh et al. (2003) indicated that UTAUT's constructs: PE, EE, SI, and FC can reveal people's beliefs, doubts, or anxieties towards technologies. Age, gender, experience, and VU are UTAUT's moderators that can affect the relationships between PE, EE, SI, FC, BI and UB.

Utilizing a model extensively used in higher education classrooms and one that can explain teachers' perceptions towards new technologies, depending on their age, gender, experience, and VU, is critical. After evaluating other technology acceptance models, I decided to use UTAUT for this study hoping its constructs can help school administrators and instructional technologists gain insights on the factors that can help predict K-12 teachers' BI to use new technologies. The model's application in today's K-12 classrooms is necessary. Awuah (2012) posited that the UTAUT model has been extensively and successfully used and accepted by multi-disciplinary researchers because its unique structure is powerful enough to explore both BI to use and UB towards technology. It is necessary and even more desirable to conduct a study that examines the factors that directly influence K-12 teachers' BI to use cloud computing for grading and feedback purposes.

K-12 teachers' work environment is a unique one even with its similarities with the work environment of other professionals. As most of this chapter's literature review indicated, teachers prefer to use technologies that are easy to use and can enhance their teaching performance. Some K-12 teachers, like other professionals in healthcare, business, information systems, and higher education also value their colleagues' opinions on using certain technologies. Support from administrators, as in support from managers and supervisors, are also important in the K-12 environment.

Table 7

Synthesis of Primary Research on UTAUT in Education

Study	Technology	Users	Data Analysis	IV on BI and UB	Moderators on BI and UB	Strength of Evidence
Birch (2003)	ICT	preservice secondary teachers at a Canadian university	Multiple regression OLS	PE, EE, SI, FC - significant impact on BI, UB with FC; BI with UB – not used	age-significant gender-not significant; experience and voluntariness of use - not significant moderator	High
Macharia (2011)	E-learning adoption in higher education	preservice teachers	PLS and PLS-Graph	PE, EE, SI - significant impact on BI, FC-not significant impact on BI; UB with FC and BI with UB – not used	voluntariness of use and age -significant; gender and experience-not significant	High
Birch & Irvine (2009)	ICT	secondary pre-service teachers	Multiple Regression	PE, EE, SI, FC - significant impact on BI, UB with FC and BI with UB – not used in this study.	age-significant; voluntariness of use and gender-not significant; experience-not used	High
Melocchi (2014)	iPads	university instructors	Hierarchical moderated multiple regression	PE, EE, SI, FC - significant impact on BI, UB with FC and BI with UB – not used	researcher did not use UTAUT's moderators in this study.	High

(table continues)

Study	Technology	Users	Data Analysis	IV on BI and UB	Moderators on BI and UB	Strength of Evidence
Williams (2015)	39 applications and 40 devices	university instructors	Confirmatory Factor Analysis	PE, EE, SI - significant impact on BI, FC-not significant impact on BI, UB with FC and BI with UB – not used	moderators were not tested in this study.	Low
Anderson et al. (2006)	PC Tablet	university instructors in the school of Business	PLS	PE - significant impact on BI, EE, SI, FC - no significant impact on BI;	gender cannot be reliably tested in this study., Age and experience-not significant; voluntariness of use –significant	High
McCombs (2011	General implementati on of technology into the curriculum	high school teachers	PLS	PE, EE, SI - significant impact on BI, FC-not significant impact on BI, UB with FC and BI with UB – not used	age – not used; gender, experience, voluntariness of Use - not significant moderators	High
Awwad & Al-Majali (2015)	Online library services	students from 6 Jordanian universities	SEM	PE, EE, SI, FC - significant impact on BI, FC-significant impact on UB, BI-significant impact on UB	age-strong moderator for PE among younger undergraduate students, age-strong moderator for EE among older undergraduate students.	High
Tibendaran a & Ogao (2010)	Online library services	library end-users including faculty and students	Cross-Sectional, Observational checklist	PE-negative impact on BI. EE – not included in the study	gender, age, experience – strong moderators for SI	High

Note. UB: Use Behavior or actual use: not included in this study

Technical assistance is an important aspect when integrating technology in education. The level of support that teachers perceive can also vary depending on their experience or number of teaching years (NCES, 1999). The National Center for Education Statistics (1999) indicated that when teachers begin their careers, induction programs help with their perceptions of support from the districts and their administrators. NCES also indicated that more comprehensive induction programs for new teachers can help with the teachers' attrition rates and most professional development programs can keep not just the new teachers but also the more experienced teachers with comprehensive technology integration and class management training programs.

Figure 12 illustrates the UTAUT model for this study with the exclusion of use behavior (UB). Table 8 is a synthesis of all the literature review on UTAUT in healthcare, business and IS including online banking, and in education.

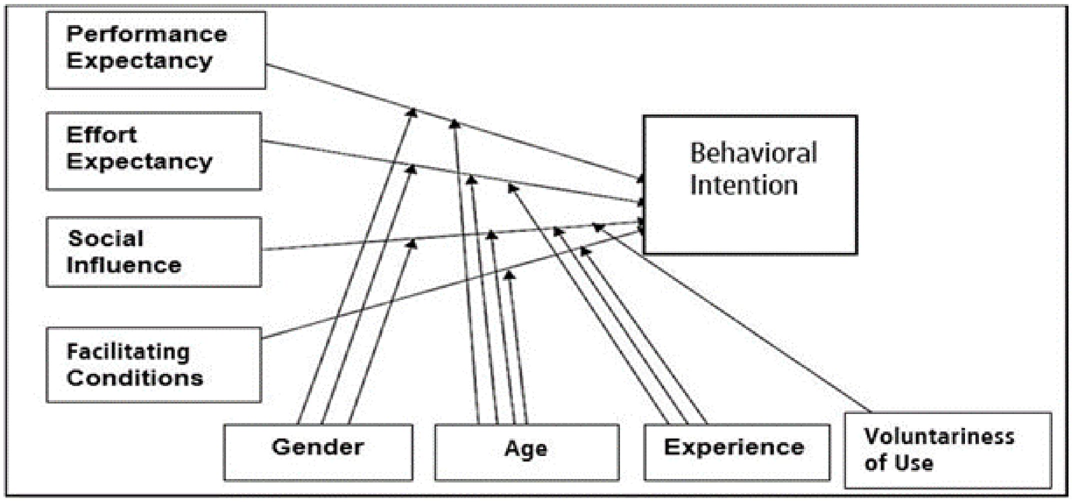

Figure 12. Unified theory of acceptance and use of technology (Venkatesh et al., 2003) without the use behavior (UB) construct.

The participants of the studies in the literature review consisted of managers and supervisors, consumers, caretakers, nurses and doctors, university professors and students. New technologies introduced in this literature review include robotic surgery, telehealth, e-health intervention, CV databases, and OERs.

Table 8

Synthesis of Primary Research on UTAUT

Study	Industry	Technology	Users	PE to BI	EE to BI	SI to BI	FC to BI
Whitten et al. (2010)	Healthcare	Telemedicine	Managers supervisors				X
Chiu & Eysenbach (2010)	Healthcare	e-health intervention	Family caregivers	X	X		
Van de Vaart et al. (2016)	Healthcare	self-management intervention	MHC, PCP	X	X	X	X
Heselmans et al. (2012)	Healthcare	EBMeDS	Physicians	X			X
Siracuse & Sowell (2008)	Healthcare	PDA	Pharmacy students	X			
Weeger & Gewald (2015)	Healthcare	EMR	Physicians	X	X		
BenMessaoud et al. (2011)	Healthcare	Robotic surgery	Surgeons				X
Diño & Guzman (2015)	Healthcare	Telehealth	Elderly patients		X		X
Hanson et al. (2011)	Healthcare	Social Media	CHES		X		X
Deng, Liu, & Qi (2011)	Business and IS	WBQAS	College students	X	X		

(table continues)

Study	Industry	Technology	Users	PE to BI	EE to BI	SI to BI	FCto BI
Wang & Wang (2010)	Business and IS	m-Internet	Consumers	X	X		
Venkatesh & Zhang (2010)	Business and IS	Not Applicable	Employees (2 cultures)	X	X	X	
Eckhardt, Laumer, & Weitzel (2009)	Business and IS	CV databases	IT Dept. superiors			X	
Curtis & Payne (2014)	Business and IS	CAAT	Auditors	X			
Fillion, Braham, & Ekionea (2011)	Business and IS	ERP system	Mid-managers/ end-users				X
Mbrokoh (2016)	Business and IS	Online banking	Consumers	X	X	X	
Saibaba & Murthy (2013)	Business and IS	Online banking	Consumers	X	X		
AbuShanab & Pearson (2007)	Business and IS	Online banking	Consumers	X	X		
Yu (2012)	Business and IS	Online banking & m-banking	Consumers			X	
Tan & Lau (2015)	Business and IS	Online banking & m-banking	Consumers	X	X		
Martinez-Caro, Cepeda-Carion, & Cegarra-Navarro	Business and IS	Online banking	Consumers	X	X	X	

(table continues)

Study	Industry	Technology	Users	PE to BI	EE to BI	SI to BI	FCto BI
Macharia (2011)	Education	e-learning	Pre-service teachers	X	X	X	
Birch (2003)	Education	ICT	Pre-service teachers	X	X	X	X
Birch & Irvine (2009)	Education	ICT	Pre-service teachers	X	X	X	X
Melocchi (2014)	Education	iPad	Instructors	X	X	X	X
Williams (2015)	Education	Apps and devices	University instructors	X	X	X	
Mtebe & Raisamo (2014)	Education	OER	University instructors	X			
Anderson et al. (2006)	Education	PC tablets	University instructors	X			
McCombs (2011)	Education	implementation of technology	Secondary teachers	X	X	X	
Awwad & Al-Majali (2015)	Education	Online library services	University students	X	X	X	X
Tibendarana & Ogao (2010)	Education	Online library services	University stakeholder			X	X

Note. OER: Open Educational Resources

Summary

Currently, there is a gap in research on the potential of cloud computing to facilitate or promote collaboration in the K-12 environment. Although multidisciplinary researchers defined collaboration in different ways, common themes emerged from these definitions. First, the relationship between collaborators are built on the foundation of trust. Second, the collaborators' relationships are reciprocal wherein different ideas and points of views are shared. The third theme characterized collaborators as individuals with mutual respect and are committed to achieving their goals. For this study, Morel's (2014) definition of collaboration was used, defining collaboration as a form of learning characterized by mutual respect and trust and wherein individuals are receptive to other people's ideas, can share and defend their points of view, and can reflect on the feedback they receive to achieve their goals.

The Literature review indicated that collaboration promotes well-executed goals, mutual agreements, commitment, co-creation of new knowledge, sharing of new ideas, reflection and feedback with shared expertise and passion among collaborators. A ubiquitous technology that encourages collaboration is cloud computing wherein collaborators work together asynchronously or in real-time. Based on primary research on technology acceptance models, collaboration, and cloud computing, I was able to identify Venkatesh et al.'s (2003) UTAUT model as the appropriate theoretical framework for this study.

Venkatesh et al. developed the UTAUT model based on eight other technology acceptance models and as an expansion of Davis (1989) technology acceptance model (TAM). Research studies on these technology acceptance models were included followed by a comprehensive literature review on UTAUT. Since the Venkatesh et al.'s (2003) UTAUT model and its survey questionnaire were extensively used in different industries such as healthcare, business and IS, and higher education, in Northern America, Europe, Africa, Asia, and in the Middle East, and since these studies indicated that UTAUT constructs can predict BI to use and UB towards the use of technology, it is only necessary to apply the UTAUT model in a study that aims to examine BI to use collaborative cloud computing for grading and feedback purposes among U.S. K-12 educators.

Chapter 3 discusses the methodology used for this study and discusses the independent and dependent variables, research design, data collection, and data analysis steps.

Chapter 3: Research Method

Introduction

The purpose of this study was to determine if Venkatesh et al.'s (2003) UTAUT constructs, which are performance expectancy, effort expectancy, social influence, and facilitating conditions are strong predictors of behavioral intent to use collaborative cloud computing for grading and feedback purposes among K-12 teachers. This chapter includes the study's research design and its relevance to the research questions, target population, sample, and sampling procedures. This chapter also includes the procedures for recruitment, participation, and data collection as well as the instrumentation and operationalization of the instrument's constructs. Finally, this chapter includes this study's data analysis plan, threats to validity, and ethical considerations and closes with a summary.

Variables and Moderators

The independent variables for this study are the four constructs of Venkatesh et al.'s (2003) UTAUT model: PE, EE, SI, and FC. The UTAUT moderators for this study are a) age, b) gender, c) experience, and d) VU. The dependent variable for this study is BI to use collaborative cloud computing for grading and feedback purposes. Although UB is one of UTAUT's dependent variables, it was not measured in this study. The "Instrumentation and Operationalization of Constructs" section of this chapter provides an explanation for excluding this construct as a dependent variable.

Researchers have used Venkatesh et al.'s (2003) UTAUT model and its survey questionnaire extensively in different industries, such as healthcare, business and IS, and higher education, in Northern America, Europe, Africa, Asia, and in the Middle East, and these studies have indicated that UTAUT constructs can predict BI and UB. Therefore, it was only necessary to apply the UTAUT model in a study aimed at examining BI to use collaborative cloud computing for grading and feedback purposes among U.S. K-12 educators.

Research Design

Correlational research design can be used to measure the association or relationship between two or more variables (Creswell, 2008). To measure the strength of relationship between UTAUT's independent variables of PE, EE, SI, FC, and UTAUT's dependent variable of BI, both Pearson and Spearman's rho correlational designs were performed. I also performed a simple linear regression to determine if PE, EE, SI, and FC can predict BI and to determine to what extent the moderators (age, gender, experience, and VU) can affect the relationships between PE, EE, SI, FC and BI.

Cross-Sectional Survey Design

In this study, I employed a cross-sectional survey design. Researchers use survey designs to collect "dispositional and contextual factors on human thought and social behavior" (Lavrakas, 2008; Visser, Krosnick, & Lavrakas, 2000, p. 223). Cross-sectional survey designs are used to measure multiple variables at one point in time (Field, 2009). My goal, using a quantitative, correlational design, was to measure the frequency in which participants held specific perceptions or beliefs. The cross-sectional survey design was most appropriate for this study (Visser et al., 2000).

Population

The population from which I drew the samples consisted of K-12 public school teachers in the Pacific Coast region of the United States. The region has 58 counties with 1129 public school districts (California Department of Education, 2017). The number of school districts in each county ranges from 2 to 101 school districts.

Recruitment Procedures

To gain access to K-12 teachers, I sent research applications to the school districts' Research, Planning, and Evaluation or administration offices. The recruitment phase started with the completion and submission of research applications to conduct this study to at least 100 out of 1129 school districts. I contacted 115 school districts through email messages, phone calls, or research applications.

I submitted research applications based on individual district requirements which were acquired from some of the districts' websites. For school districts that did not have set protocols or guidelines for outside researchers posted on district websites, I initiated phone calls and left messages as necessary and/or sent emails with follow-up phone calls and emails when needed. The email invitation (Appendix C), initial phone script (Appendix D), and follow-up phone script (Appendix E) were approved by the Institutional Review Board (IRB) before I conducted this study.

Survey Dissemination

Through SurveyMonkey, I created a master survey template (Appendix G). I provided the participating school districts with specific SurveyMonkey links, which they distributed to all their K-12 teachers. Participants received email invitations directly from their school districts with the consent form and a link to this study's survey. Each school district had a unique link for data aggregation. The links were available to the participants for 30 days. An informed consent (Appendix F) served as a cover page for the survey, which also indicated that participation in this study was voluntary and anonymous and that participants could exit the survey at any time.

Sampling and Sampling Procedures

An a priori sample size calculation using Faul et al.'s (2009) G*Power 3.1.9.2. software with an effect size of .20, as recommended for small sample size, .05 probability error, .80 power, and 4 predictors resulted in this study's total required sample size of 65. A total of 129 participants completed the survey. The smallest number of participants in a school district was two while the largest number of participants in a school district was 39.

This study employed a convenience sampling method, a type of nonprobability sampling (Laerd Statistics, 2012e). In this study, I focused on the K-12 teacher population in the region to help answer my research questions. Although my sample population was not a general representation of the K-12 teacher population, the participants have similar characteristics.

Sampling Frame

All K-12 teachers in participating school districts were included in this study. No groups of teachers were excluded from the sample population.

Informal Agreements

To assess whether school districts would be open to participating in this study, I sent out informal invitations via email to school districts' administration offices. I received informal agreements from two school districts to participate in this study pending IRB approval. As expected, these school districts formally agreed to participate in the study. An additional 11 school districts agreed to participate in this study after IRB approval.

Research Questions and Hypotheses

This study was guided by these research questions and hypotheses:

RQ1: What is the relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0 1$: There is no relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

$H_a 1$: There is a relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ2: What is the relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$2: There is no relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a2: There is a relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ3: What is the relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$3: There is no relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a3: There is a relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ4: What is the relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$4: There is no relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a4: There is a relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ5: To what extent does the moderator age moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$5: Age does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a5: Age moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ6: To what extent does moderator age moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

H_06: Age does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a6: Age moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ7: To what extent does moderator age moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

H_07: Age does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a7: Age moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ8: To what extent does moderator age moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

H_08: Age does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H$_a$8: Age moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

RQ9: To what extent does moderator gender moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

H$_0$9: Gender does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H$_a$9: Gender moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ10: To what extent does moderator gender moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

H$_0$10: Gender does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H$_a$10: Gender moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ11: To what extent does moderator gender moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

H$_0$11: Gender does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a11: Gender moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ12: To what extent does moderator gender moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$12: Gender does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a12: Gender moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

RQ13: To what extent does moderator experience moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$13: Experience does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a13: Experience moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ14: To what extent does moderator experience moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$14: Experience does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a14: Experience moderates the relationship between K-12 EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ15: To what extent does moderator experience moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$15: Experience does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a15: Experience moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ16: To what extent does moderator experience moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$16: Experience does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a16: Experience moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

RQ17: To what extent does moderator VU moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$17: VU does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

*H_a*17: VU moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ18: To what extent does moderator VU moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

*H_0*18: VU does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

*H_a*18: VU moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ19: To what extent does moderator VU moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

*H_0*19: VU does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

*H_a*19: VU moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ20: To what extent does moderator VU moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

*H_0*20: VU does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

*H*a20: VU moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

Instrumentation and Operationalization of Constructs

I employed Venkatesh et al.'s (2003) UTAUT survey. The instrument was developed to determine the factors that influence BI to use and UB towards technology in business and IS. Permission to use the UTAUT survey was obtained from the developer(s) (See Appendix A).

Reliability and Validity of the Instrument

McCombs (2011) referred to factor analysis as a "technique used to identify the underlying constructs that explain the variations in the measures by reducing several observable items to a smaller number of latent variables" (p. 88). McCombs further explained:

> A factor analysis begins with deriving a communality estimate for each variable to estimate the amount of the variance that is error free and is shared with other variables in the matrix. The estimate of the communalities determines the proportion of the variance in a variable that is reproduced in the factor. The communality for a given variable can be interpreted as the proportion of variation in that variable explained by the factors. (p. 91)

Researchers often use factorial analysis to analyze the weighted items or responses that create factor scores which can help determine the reliability and validity of an instrument (Laerd Statistics, 2015a). Factor analyses require that "a minimum α coefficient between 0.65 and 0.8 is recommended, however, α coefficient that is less than 0.5 is usually unacceptable" (Laerd Statistics, 2015). The UTAUT instrument has been tested and confirmed by previous researchers for its reliability and validity.

In examining the BI to use an auction website among Chinese consumers, Pahnila, Siponen, and Zheng (2011) tested the UTAUT model which resulted to 0.784 for PE 0.759 for EE, 0.811 for SI, and 0.792 for FC. UB had a factor loading of 0.965 and BI had a factor loading of 0.883.

Alsheri, Drew, Alhussain, and Alghamdi (2012) confirmed the construct, convergent, and discriminant validity and reliability of the UTAUT instrument when examining individuals' BI to use e-government services in Saudi Arabia. Alsheri et al.'s (2012) results after testing the reliability of the UTAUT instrument produced factor loadings of 0.83, 0.84, 0.83, and 0.77 factor loadings for PE, EE, FC, and SI respectively.

In Phichitchaisopa and Naenna's (2013) study that examined BI to use health information technology services among health care representatives in Thailand. Testing the reliability of the UTAUT instrument resulted in factor loadings of 0.859, 0.815, 0.879, and 0.925, and 0.863 for PE, EE, FC, SI, and BI respectively. In Al-Qeisi, Dennis, Hegazy, and Abbad's (2015) study, which aimed to predict internet banking behavior among consumers in third world countries, testing the model generated standardized factor loadings of 0.842, 0.939, and 0.882 for PE; 0.820, 0.885, and 0.844 for EE; 0.893 and 0.875 for SI; 0.904, 0.950, 0.939 for BI; and 0.795 and 0.882 for UB. FC was not measured due to the nature of the study. Average Variance Extracted (AVE) generated 0.790, 0.782, 0.723, 0.867, and 0.705 for PE, EE, SI, BI, and UB respectively with reliability estimates of 0.916, 0.884, r^2=0.887, 0.951, and r^2=0.824 for PE, EE, SI, BI, and UB respectively.

Performance Expectancy

Performance Expectancy (PE) is the basis to which individuals use technology if they believe using it can positively affect their “job performance” (Ghandalari, 2012, p. 803). Previous testing of PE “has produced a Cronbach’s alpha for reliability of between 0.89 and 0.98” (Venkatesh & Davis, 2000, p. 203). Macharia (2011) also reported factor loadings for validity above 0.72. Legris et al.’s (2003) reported “acceptable level of internal consistency greater or equal to 0.83” (p. 99).

Effort Expectancy

Effort Expectancy (EE) is the basis to which individuals use technology if they believe using it is easy (Ghandalari, 2012, p. 802). Previous testing of EE has produced a “Cronbach’s alpha for reliability of above 0.79” (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh, Morris, & Ackerman, 2001) and factor loadings for validity above 0.59 (Davis, 1989). Studies emphasizing cultural contexts including Alghatani et al.’s (2007) and Banyopadhyay and Fraccastor’s (2007) studies reported factor loadings of 0.84, 0.82, 0.83 and 0.85 and 0.91, 0.87, 0.92 and 0.86, respectively.

Social Influence

Social Influence (SI) is the basis to which individuals decide to use technology if they believe that the people who are important to them are already using it or will support their use of this technology (Ghandalari, 2012). Macharia (2011) indicated that, previous testing of SI as produced a Cronbach's alpha for reliability of above 0.80 and factor loadings for validity above 0.55. More recent studies emphasizing cultural contexts including Al-Gahtani et al.'s (2007) and Bandyopadhyay and Fraccastoro's (2007) studies produced factor loadings of 0.94, 0.95, 0.92 and 0.91 and 0.97, 0.95, 0.92 and 0.90 for each of the items, respectively.

Facilitating Conditions

Facilitating Conditions (FC) is the basis to which individuals decide to use technology if they believe that "technical and organization infrastructures" are available for them (Ghandalari, 2012, p. 803). Venkatesh et al. (2003) found that facilitating conditions had no effect on BI but was a positive predictor of technology use. Cronbach's alpha for reliability of facilitating conditions in Melocchi's (2014) study generated a reliability of above 0.84 while Cronbach's alpha for reliability of facilitating conditions in McComb's (2011) study generated a reliability of 0.77.

Behavioral Intent

Behavioral Intent (BI) is the extent to which an individual consciously resolves to behave in a certain way in the future (Venkatesh et al., 2003). Hu, Chau, Sheng, and Tam (1999) reported Cronbach's alpha for reliability of above 0.86 and factor loadings for validity above 0.65. Studies encompassing cultural differences produced factor loadings of 0.73, 0.70, and 0.72 (Al-Gahtani et al., 2007), and 0.95, 0.98, and 0.96 (Bandyopadhyay & Fraccastoro (2007).

Exclusion of Use Behavior

Use Behavior (UB), which is a self-reported psychological construct on an individual's actual use of technology, was not measured in this study. According to Vazire (2005), although data from informants are such "rich source of information" (p. 2), most researchers consider self-reports as "difficult and invalid" (McDonald, 2008, p. 81). Self-reports should be avoided because these constructs are too complex to measure even when participants are certain about their responses (Paulhus & Vazire, 2008).

Data Source

The population from which the samples were drawn included K-12 public school teachers in the Pacific coast region of the United States. Out of 1029 school districts in the region, 13 school districts participated in this study. Recruitment phase began with letters of interest prior to IRB approval. After receiving approval from IRB, research application packets were sent out to school districts with specific protocols for outside researchers. The administration offices of school districts that did not have specific protocols were contacted by phone and/or email.

Recruitment

I began the recruitment phase by sending out electronic letters of interest to conduct research studies to school districts' administrators' or superintendents' offices. This process started before I received an approval to conduct this study from the IRB office. The letters of interest provided a glimpse of how school districts might respond to my request. I received conditional approval letters to conduct my study from 2 school districts. These school districts were among the 13 school districts that agreed to participate in this study.

After receiving an approval from the IRB office, I reviewed different school district websites and submitted research application packets to districts that required them. For school districts that did not have set research application guidelines posted on their websites, I contacted their administration offices by phone calls, emails, and follow-up emails. Each of the 13 school districts that agreed to participate in this study was given a unique SurveyMonkey link for the participants to access the UTAUT questionnaire.

From some of my conversations with the school districts' administrators, the main concerns that school administrators had when allowing their teachers to participate in any study included a) confidentiality or the assurance that the teachers' identity would not be revealed, b) awareness that completing the survey was voluntary, and c) participation would not interrupt instructional time. All concerns were addressed in the research application packets and/or IRB approved email messages and consent form. Therefore, the school districts distributed the SurveyMonkey link to the participants via email and may have added additional information in their email messages to their teachers to emphasize these concerns.

UTAUT Questionnaire

Venkatesh et al.'s (2003) UTAUT questionnaire was the instrument used for this study. The questionnaire consisted of 20 questions with four of these questions pertaining to UTAUT's moderators: a) age, b) gender, c) number of years of experience with collaborative cloud computing tools (experience), and d) voluntariness of use of collaborative cloud computing tools at the participant's school district. There were 3 questions under the performance expectancy construct, 3 questions under the effort expectancy construct, 3 questions under the social influence construct, 4 questions under the facilitating conditions construct, and 3 questions under the behavioral intent construct.

Data Analysis Plan

Each of the 13 participating school districts was given a unique survey link through the SurveyMonkey web survey platform. Analyzing the data from the survey platform consisted of exporting the survey results to Excel which were then imported to SPSS for further analyses. The SurveyMonkey link was completed by 129 participants which was more than the required number of participants of 65 based on the power analysis performed before conducting this study. I exported all the Survey Monkey data into Excel and PDF formats. Survey Monkey allowed me to export both summary and individual responses in both formats. Both formats were also exported with graphs and textual and numerical data.

Data Coding

Data preparation consisted of assigning numerical codes to all the variables (See Tables 9 to 12). The code book served as my guide that identified all the variables in this study and all the minimum to maximum values for these variables. I entered all the UTAUT moderators and variables into SPSS. Next, I imported the Excel files from SurveyMonkey into SPSS. Since there were 13 participating school districts, there were 13 Excel workbooks that were consolidated into one Excel sheet before a final import into SPSS.

Table 9 shows the codes for gender. Gender is one of Venkatesh et al.'s (2003) UTAUT moderators.

Table 9

Coding Gender in SPSS

Gender	Coding Number
Male	01
Female	02
Missing Data	99

Note. Gender: UTAUT moderator

Table 10 shows the codes for age groups. Age is one of Venkatesh et al.'s (2003) UTAUT moderators.

Table 10

Coding Age in SPSS

Age	Coding Number
21-25	11
26-30	12
31-40	13
41-50	14
51+	15
Missing Data	99

Note. Age: UTAUT moderator

Table 11 shows the codes for the number of years of experience participants have with using collaborative cloud computing tools or similar tools. Experience is one of Venkatesh et al.'s (2003) UTAUT moderators.

Table 11

Coding Years of Experience in SPSS

Years of Experience	Coding Number
< 1	21
1-3	22
4-6	23
7-9	24
10-12	25
13-15	26
Missing Data	99

Note. Experience: UTAUT moderator; number of years of use of collaborative cloud computing tools or similar tools

Table 12 shows the codes for voluntariness of use. Voluntariness of use is one of Venkatesh et al.'s (2003) UTAUT moderators.

Table 12

Coding Voluntariness of Use in SPSS

Years of Experience	Coding Number
Completely Mandatory	1
Mostly Mandatory	2
Somewhat Mandatory	3
Neutral	4
Somewhat Voluntary	5
Mostly Voluntary	6
Completely Voluntary	7
Missing Data	99

Note. Voluntariness of use of collaborative cloud computing tools at the participants' school sites.

Missing Data

The Excel format was critical for my data analysis for two reasons: a) it was easily exported to SPSS, and b) it easily flagged missing data. Using only the PDF format from SurveyMonkey, I noticed that the missing data were skipped and were not flagged which gave me an initial impression that the respondents completed all the questions. Since, the participants in this study were not forced to answer each survey question, there were some missing data that only appeared in the Excel format.

There are several ways to handle missing data. Young, Weckman, and Holland (2011) reviewed various studies and created guidelines. The authors reported that a) any outcome from a missing data of 1% is inconsequential, b) outcomes from a missing data of 5% to 15% missing data should be handled with multiple imputation, and c) any type of imputations would be meaningless for outcomes with more than 15% of missing data. Since data outcomes resulted to only 5% of missing data, a mode imputation was performed. With mode imputation, SPSS generated pooled results based on the mode measures in the data set.

Statistical Tests

Principal Component Analysis (PCA)

PCA was used for data reduction. PCA is a statistical test that transforms numbers of potentially correlated components. PCA's main purpose is to find patterns, compress these patterns, and reduce the dimensions without losing much of the information in the data set (Laerd Statistics, 2015_b). Therefore, I performed a PCA test on the data set and results of the PCA output is discussed in Chapter 4.

Correlational Tests

To measure the strength of the relationship between two variables, both parametric (Pearson) and non-parametric (Spearman rank order correlation coefficient) correlations were used (Field, 2009). The Pearson correlation coefficient measures the strength of the linear association between two variables by drawing a line of best fit in the data set through two variables (Field, 2009). The Spearman rank-order correlation coefficient (Spearman's correlation) is a nonparametric test that measures the strength of association between two variables and is denoted by the r^2 symbol or ρ. Both parametric and non-parametric correlations were used for this study's data set. Results of these tests are discussed in Chapter 4.

Kaiser-Meyer-Olkin and Bartlett's Test

The adequacy of the sample was tested with Kaiser-Meyer-Olkin. Beavers et al. (2013) explained that the "Kaiser-Meyer-Olkin Test of Sampling Adequacy (KMO) is a measure of the shared variance in the items" (p. 4).

Cronbach's Alpha Reliability Test

A Cronbach's alpha test was performed to measure the internal consistency or if a set of items are related as a group (Laerd Statistics, 2015_c). An acceptable Alpha coefficient is greater than .70 (Beavers et al., 2013). Results from the Cronbach's Alpha test are discussed in Chapter 4.

Potential Time and Resource Constraints

There were potential time and resource constraints for using a cross-sectional survey design for this study. First, the process was time-consuming. Contacting school districts was challenging since there were different protocols for each school district on how to handle outside research requests. There was also no guarantee that K-12 teachers would complete the survey even if their administrators had given me an approval to conduct this study and had provided their teachers with the survey link. For instance, I only received 7 completed surveys from a school district that has over 2000 K-12 teachers. Also, in using cross-sectional survey design, data were collected from the participants at "a single point in time," which suggest that participants' perceptions about cloud computing for grading and feedback purposes could also change over time (Visser et al., 2000, p. 225).

Threats to Validity

One of the threats to validity in this study was sampling error. A sampling error is characterized by a difference between an estimated relationship between the predictor variable and the criterion variable in the sample population and a true relationship between the two variables in the target population (Trochim, Donnelly, & James, 2008). One way to overcome a sampling error is to draw a larger sample by conducting a study at multiple sites (Creswell, 2013; Trochim et al., 2008). Having more than the required number of completed surveys helped resolve this threat. However, having 13 school districts was still a very small outcome compared to over 1000 school districts in the region.

Conclusion validity is another threat to validity in correlational studies and is characterized by researchers' attempts to reach to some conclusion about a relationship between variables even though there is no real relationship between them or an attempt by researchers to infer that there is no relationship between two variables even though there is indeed a relationship between them (Trochim et al., 2008). To improve conclusion validity, a good statistical power is required. The statistical power in this study, as recommended by Trochim et al. (2008) was greater than 0.80. I also made sure that all data analyses steps were taken care of with great caution to ensure the validity of this study and the reliability of the results reported from this study.

Construct validity is characterized by evaluating how constructs are measured. Threats to construct validity include inaccurate definition of the constructs, mono-operation bias, and mono-method bias (Downing & Clark, 1997). Defining the constructs based on the developer's definitions helped reduce the threat to construct validity (Boslaugh, 2008). Using a pre-existing instrument that has been used and confirmed by previous researchers to be valid and reliable also reduced the threat to construct validity (Boslaugh, 2008; Field, 2009). Finally, testing the hypothesized relations ensured that I addressed the threat to construct validity (Downing & Clark, 1997).

Ethical Considerations

Concerns for the rights and welfare of human research subjects were my main priorities. My doctoral committee reviewed this research and data collection took place after receiving an IRB approval (Approval Number 09-25-17-036293). To establish relationships with the school districts' research, evaluation, and planning departments, initial phone calls and/or emails were made to at least 100 school districts followed by follow-up phone calls and/or emails. Application packets for outside researchers were also sent to school districts with research protocols posted in their websites. When communicating with school district administrators and staff, I emphasized the benefits of this study, its voluntary nature, the assurance that the participants' personal information would not be collected, and the option that participants could exit the survey at any time. I also emphasized that participating in this study would not interrupt instructional time.

Using the convenience sampling method, this study used Survey Monkey with a consent form as the cover page for the online survey questionnaire. Using Venkatesh et al.'s (2003) UTAUT questionnaire, there were 20 questions in the survey. The consent form identified the purpose of this study and reiterated the study's potential benefits. The consent form described this study's data security measures such as data encryption, password protection, and the use of codes to analyze the sample's demographics including age and gender to ensure the participants' anonymity.

The participants were informed that this study would not pose risks to their safety and well-being, but that they could experience some minor risks or discomforts associated with participating in this study including fatigue and stress or becoming frustrated. However, Venkatesh et al.'s (2003) UTAUT questionnaire was a short survey, consisting of 20 questions which I estimated for participants to complete within 15-30 minutes. The average time the participants took to complete the survey was 4-5 minutes. Reviewing the survey, I realized how simple it was to complete it and that it was realistic to complete the survey in 4-5 minutes. Venkatesh et al.'s UTAUT questionnaire was worded in the simplest manner which I think contributed to the lesser amount of time needed to complete it.

I omitted the names of the participating school districts. I did not need parental consent forms since the potential participants for this study were all adults who did not receive any compensation for their participation. Study findings are locked in a secure file cabinet and a virtual cloud (OneDrive) that Walden University has provided for five years before deletion. My role as an instructional technologist at a private K-12 school has not compromised this study.

Summary

In this chapter, I discussed the research design and methodology of this study. Information on the potential participants, sampling, procedures for recruitment, and distribution of the survey questionnaire were included. Operational definitions of UTAUT's constructs and plans for data collection and analyses were explained. The validity and reliability of the instrument and plans for coding the dependent variable, independent variables, and the moderators for this study were discussed. Tests for assumptions relevant to quantitative, correlational research were identified. The results and findings of this study are explained in Chapter 4.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to determine if Venkatesh et al.'s (2003) UTAUT constructs are strong predictors of K-12 teachers' behavioral intent to use collaborative cloud computing for grading and feedback purposes. The UTAUT questionnaire was administered online to K-12 teachers of 13 participating school districts in the Pacific Coast region of the United States. I exported survey responses to a spreadsheet and imported them to SPSS for further analyses. In this chapter, I explain the survey administration process, data screening procedures, and the descriptive statistics of the sample population, along with the statistical tests performed to answer the research questions and to accept or reject the null and alternative hypotheses for this study. This chapter concludes with the summary of the results of the data analyses.

Survey Administration

Each of the administrative offices of the 13 participating school districts distributed a unique web link to the modified version of Venkatesh et al.'s (2003) UTAUT questionnaire (See Appendix G) to their K-12 teachers between October 2017 and January 2018. No personal information was collected, ensuring confidentiality. The average time that it took to complete the survey was 4 minutes. The number of teachers who participated in this study varied from 2 to 39 participants per school district.

It should be noted that 12 of the participating school districts communicated with me via email about their decision to participate in this study. These school districts were given a survey link for their teachers. However, one out of 13 participating school districts sent out the survey before I could create a unique link for their teachers. Therefore, this school district used the link to the sample survey instead of waiting for a unique link to be distributed to their teachers. I then created another sample link for other school districts to review. This minor incident did not affect the outcomes of this study. Therefore, I proceeded to examine the data received from all participating school districts.

Data Preparation

I exported the summary and individual responses from the survey platform to Excel and PDF formats. The Excel formats flagged missing data that had otherwise been missed in the PDF format. Because there were 13 participating school districts in this study, there were 13 data sets generated and exported from the survey platform. All data sets were consolidated into one Excel workbook and then imported to SPSS for data analyses.

Data Screening

I assigned each survey response a case number. I developed a codebook (Appendix H) to record the variables, variable values, and column information imported from Excel into SPSS. This information is also stored in a cloud drive and flash drive for 5 years.

Missing Data

Of the 129 surveys received, 7 cases, or 5% of the total submissions had missing data. One respondent did not answer the questions pertaining to age and gender and was therefore excluded from the analyses of demographic subgroups and analyses of moderating factors with UTAUT's constructs. One respondent did not answer two questions relevant to facilitating conditions and behavioral intent. The remaining three respondents did not answer one question relevant to either social influence or performance expectancy. In this study, I performed mode imputation to fill in the missing values. Mode imputation is the use of the most common value in the data to fill in the unknown (Chen, Jain, & Tai, 2006).

Recoding of FC3. Field (2009) explained that negatively worded items in a survey must be recoded before conducting statistical tests. The third question under FC was negatively worded and was therefore recoded:

F3: *Using collaborative cloud computing tools for grading and feedback purposes is not compatible to my operating system. (Example: Windows, iOS, Chrome).*

Descriptive Statistics

There were 129 participants in this study. This sample size was higher than the a priori sample size of 65 participants and the sample size goal of 100 participants. Since one respondent did not answer the gender and age questions, only 128 participants were included in the gender and age analyses.

Of the 129 completed surveys, 20% (n = 26) were male, 80% (n = 102) were female. Figure 13 shows the gender distribution for this data set. Historically, there has always been a large gender gap in the teaching profession. In 2012, it was reported that female teachers make up 76 percent of the nation's public-school teachers (California

Department of Education, 2017).

There were 43 participants (33%) in 31-40-year old age group, 37 participants (29%) in the 51+ year-old age group, 32 participants (25%) in the 41-50-year-old age group, 13 participants (29%) in the 26-30-year-old age group, and three (2%) in the 21-25-year-old age group.

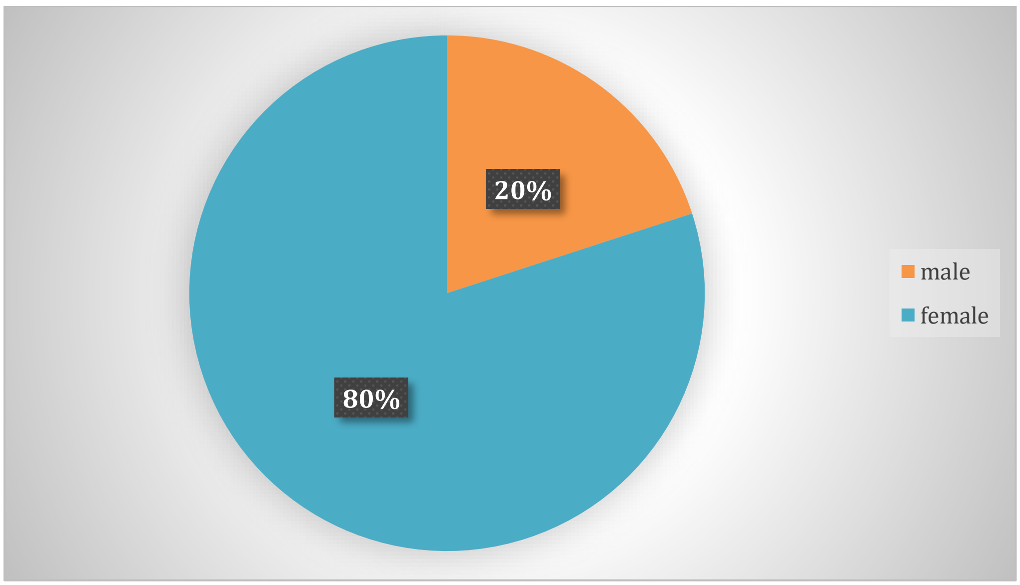

Figure 13. Gender Distribution of this Study's Participants

Table 13 shows the age group distribution for this data set. The percentage of teachers in the region below the age of 45 and at or over the age of 55 in 2011 to 2012 was 44.8% (National Center for Education, 2017).

Table 13

Percentage of Participants by Age Group

	Age Group	Freq.	Percentage	Valid Percent	Cumulative Percent
Valid	21-25	3	2.3	2.3	2.3
	26-30	13	10.1	10.2	12.5
	31-40	43	33.3	33.6	46.1
	41-50	32	24.8	25	71.1
	51+	37	28.7	28.9	100
	Total	128	99.2	100	
Missing	1		0.8		
Total	129		100		

Note. Freq. = Frequency

The participants were asked, "How many years have you been using collaborative cloud computing such as Google Drive, OneDrive, and Dropbox or similar technologies?" Fifty-three (41%) of the participants indicated that they have 1-3 years of experience with collaborative cloud computing tools, 40 participants (31%) indicated 4-6 years, 22 participants (17%) indicated having 7-9 years, and six participants (5%) indicated 13-15 years. Finally, four participants (3%) indicated having 10-12 years, and another four participants (3%) indicated having less than 1 year of experience with collaborative cloud computing tools.

Table 14 shows the distribution of the participants' years of experience with collaborative cloud computing.

Table 14

Distribution of Participants' Experience with Collaborative Cloud Computing

	Age Group	Freq.	Percentage	Valid Percent	Cumulative Percent
Valid	<1	4	3.1	3.1	3.1
	1-3	53	41.1	41.1	44.2
	4-6	40	31.0	31.0	75.2
	7-9	22	17.1	17.1	92.2
	10-12	4	3.1	3.1	95.3
	13-15	6	4.7	4.7	100.0
Total	129		100.0	100.0	

Note: Freq. = Frequency

When asked if using collaborative cloud computing tools is voluntary or mandatory at their school sites, 38 participants (30%) indicated that the use of these tools is *completely voluntary*, 26 participants (20%) indicated *somewhat mandatory*, and 23 participants (18%) indicated *mostly voluntary*. Fourteen participants (11%) indicated that the use of collaborative cloud computing tools is *completely mandatory*, whereas thirteen participants (10%) selected the *neutral* answer. Finally, eight participants (6%) and seven participants (5%) indicated that using collaborative cloud computing tools at their school sites are *somewhat voluntary* and *mostly mandatory*, respectively.

Table 15 shows the distribution of the voluntariness of use of collaborative cloud computing at the participants' school sites.

Table 15

Distribution of Participants' Voluntariness of Use

Survey Response	Freq.	Percentage	Valid Percent	Cumulative Percent
Completely Mandatory	14	10.9	10.9	10.9
Mostly Mandatory	7	5.4	5.4	16.3
Somewhat Mandatory	26	20.2	20.2	36.4
Neutral	13	10.1	10.1	46.5
Somewhat Voluntary	8	6.2	6.2	52.7
Mostly Voluntary	23	17.8	17.8	70.5
Completely Voluntary	38	29.5	29.5	100.0
Total	129	100.0	100.0	

Note. Freq.: Frequency

Statistical Test Results

I implemented a survey based on a Likert-type scale to evaluate K-12 teachers' BI to use collaborative cloud computing for grading and feedback purposes. There were 20 questions in the survey of which 16 questions are relevant to the UTAUT constructs, and 4 questions were relevant to the UTAUT moderators. The UTAUT survey responses have seven categories: a) *I completely agree*, b) I *mostly agree*, c) *I somewhat agree*, d) *I* *am neutral*, e) *I somewhat disagree*, f) *I mostly disagree*, and g) *I completely disagree*. Statistical tests including a) PCA, b) Pearson correlation, c) Spearman correlation, and d) linear regression were performed on this study's data to answer the following research questions and hypotheses:

RQ1: What is the relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$1: There is no relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a1: There is a relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ2: What is the relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$2: There is no relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a2: There is a relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ3: What is the relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$3: There is no relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a3: There is a relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ4: What is the relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes?

H_04: There is no relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a4: There is a relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

RQ5: To what extent does the moderator age moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

H_05: Age does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a5: Age moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ6: To what extent does moderator age moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

H_06: Age does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a6: Age moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ7: To what extent does moderator age moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

H_07: Age does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a7: Age moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ8: To what extent does moderator age moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

H_08: Age does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a8: Age moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

RQ9: To what extent does moderator gender moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

H_09: Gender does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a9: Gender moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ10: To what extent does moderator gender moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0 10$: Gender does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

$H_a 10$: Gender moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ11: To what extent does moderator gender moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0 11$: Gender does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

$H_a 11$: Gender moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ12: To what extent does moderator gender moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0 12$: Gender does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

*H_a*12: Gender moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

RQ13: To what extent does moderator experience moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$13: Experience does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a13: Experience moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ14: To what extent does moderator experience moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$14: Experience does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a14: Experience moderates the relationship between K-12 EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ15: To what extent does moderator experience moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$15: Experience does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a15: Experience moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ16: To what extent does moderator experience moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$16: Experience does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a16: Experience moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

RQ17: To what extent does moderator VU moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$17: VU does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a17: VU moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ18: To what extent does moderator VU moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$18: VU does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

*H*a18: VU moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

RQ19: To what extent does moderator VU moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$19: VU does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a19: VU moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

RQ20: To what extent does moderator VU moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$20: VU does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a20: VU moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

Reliability Test

The purpose of an assessment validity is to determine if the operationalization of the constructs is reliable. There were 16 questions pertaining to the UTAUT's constructs of performance expectancy, effort expectancy, social influence, and behavioral intent (See Table 16).

Table 16

Scales and Items of the UTAUT Survey for this Study

Item #	Statement	Mean	S.D.	N
PE1	I find collaborative cloud computing tools for grading and feedback purposes useful for my job.	2.3566	1.58014	129
PE2	Using collaborative cloud computing tools for grading and feedback enables me to accomplish my tasks quickly.	2.5349	1.69118	129
PE3	Using collaborative cloud computing tools for grading and feedback purposes increase my productivity.	2.7364	1.70257	129

(table continues)

Item #	Statement	Mean	S.D.	N
EE1	It would be easy for me to become skillful at using collaborative cloud computing tools for grading and feedback purposes.	2.1473	1.54667	129
EE2	I would find collaborative cloud computing tools for grading and feedback purposes easy to use.	2.2946	1.52276	129
EE3	Learning to operate collaborative cloud computing tools for grading and feedback purposes is easy for me.	2.2791	1.50508	129
SI1	People who influence my behavior think that I should use collaborative cloud computing tools for grading and feedback purposes.	3.0853	1.60580	129
SI1	People who influence my behavior think that I should use collaborative cloud computing tools for grading and feedback purposes.	3.0853	1.60580	129
SI2	People who are important to me think that I should use collaborative cloud computing tools for grading and feedback purposes.	3.2713	1.71734	129
SI3	In general, this school has supported the use of collaborative cloud computing tools for grading and feedback purposes.	2.4729	1.69133	129

(table continues)

Item #	Statement	Mean	S.D.	N
FC1	I have the necessary resources to use collaborative cloud computing tools for grading and feedback purposes.	2.4341	1.66698	129
FC2	I have the knowledge necessary to use collaborative cloud computing for grading and feedback purposes.	2.5581	1.72258	129
FC3	Using collaborative cloud computing tools for grading and feedback purposes is not compatible to my operating system. (Example: Windows, iOS, Chrome)	5.2403	2.08707	129
FC4	If I have some difficulties with the use of collaborative cloud computing tools for grading and feedback purposes, a specific person (or group) is available for assistance.	3.3178	1.96447	129
BI1	I intend to use collaborative cloud computing tools for grading and feedback purposes in the near future.	2.4961	1.75501	129
BI2	I predict I would use collaborative cloud computing tools for grading and feedback purposes in the near future.	2.3876	1.71987	129
BI3	I plan to use collaborative cloud computing tools for grading and feedback purposes in the near future.	2.4496	1.77201	129

Note. a). S.D. = Standard Deviation

Cronbach's alpha test measures the internal consistency for this sample as suggested in Laerd Statistics (2015c). I used the UTAUT questionnaire to measure K-12 teachers' BI to use collaborative cloud computing for grading and feedback purposes. The Cronbach's alpha for these 20 items was .894. An inspection of the data analysis indicated that scale reliability could be improved by eliminating the 4 moderating variables of age, gender, experience, and VU. A re-analysis with these four items removed from the final scale indicated that scale reliability measurably improved, Cronbach's alpha = .929, reaching the conventional standards for scale reliability (See Table 17).

Table 17

Cronbach's alpha Reliability Statistics Results

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.929	.935	16

Note. Items pertained to UTAUT's performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions, (FC), and behavioral intent (BI).

Principal Component Analysis

This study utilized Venkatesh et al.'s (2003) UTAUT. The UTAUT survey in this study consisted of 16 components, each in a 7-point Likert-type scale, to measure BI, PE, EE, SI, and FC. A PCA "aims to reduce a set of variables into a smaller set of dimensions called components" (Field, 2009, p. 667). PCA was performed on 16 items in the survey that measured K-12 teachers' BI, PE, EE, SI, and FC. The suitability of PCA was assessed prior to analysis:

Study Design

The first two assumptions for performing a PCA pertain to this study's study design. The assumptions that the data set has multiple continuous or ordinal variables and measured with a Likert-type scale were met.

Sample Adequacy

The third assumption for performing a PCA is sample adequacy which was assessed by conducting a Kaiser-Meyer-Olkin (KMO) test. The acceptable overall KMO index values are between 0.8 and 1 (Beavers et al., 2013). Since the KMO measure for this study is .886, the third assumption was also met.

Data Reduction

The Bartlett's Sphericity test checks for any redundancy between the variables which can help reduce the set with fewer factors. If Bartlett's test of significance level is less than 0.05, PCA can be used for further analyses (Field, 2009). The Bartlett's test of sphericity, $p = .01$ was significant. PCA with Varimax rotation was performed to examine if any of the components could be loaded into a single component. The scree plot in Figure 14 represents the eigenvalues and factors generated from the PCA (Cattell, 1978).

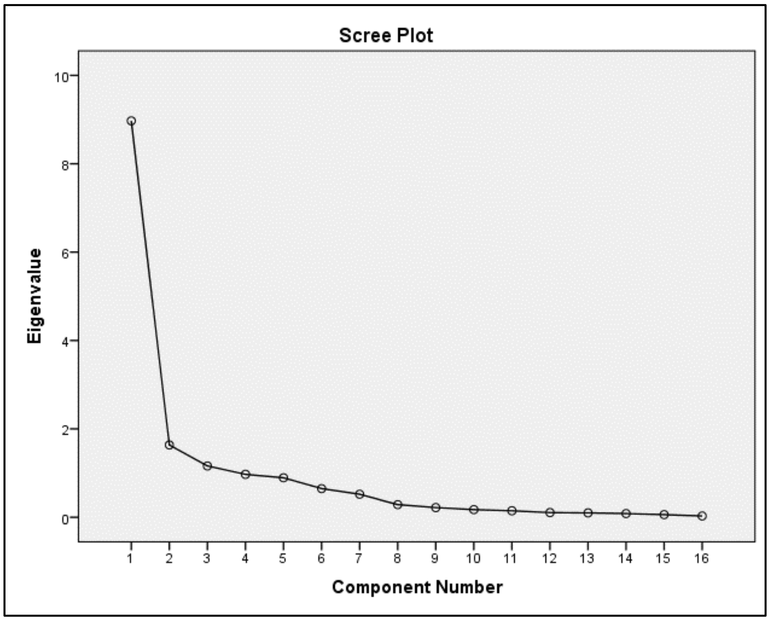

*Figure 14.*Scree plot from the PCA test.

To determine the number of factors that need to be retained, I examined the data points in the scree plot that meets an inflexion point. Costello and Osborne (2005) explained that scree plots are more reliable on studies with more than 200 participants where the points at the inflection are less clustered. Therefore, the percent of variances table was also examined to identify the factor loadings that are greater than 1. The eigenvalues (Table 18) showed that the first factor explained 56% of the variance, the second factor 10% of the variance, and the third factor, 7% of the variance. The fourth component was just under one, explaining 5% of the variance. The variance table shows the eigenvalues leveling off after three factor loadings.

Table 18

Eigenvalues with Percent of Variance from PCA

Comp.	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Sq. Loadings		
	Total	% of Va.	Cumul. %	Total	% of Var.	Cumul %	Total	% of Var.	Cumul. %
1	8.97	56.0	56.0	8.97	56.07	56.07	6.14	38.3	38.3
2	1.63	10.2	66.2	1.63	10.22	66.29	2.99	18.6	57.0
3	1.16	7.26	73.5	1.16	7.260	73.55	2.63	16.4	73.5
4	0.97	6.06	79.6						
5	0.89	5.58	85.2						
6	0.64	4.05	89.2						
7	0.52	3.25	92.5						
8	0.28	1.78	94.3						
9	0.21	1.37	95.6						
10	0.17	1.07	96.7						
11	0.14	0.91	97.6						
12	0.10	0.66	98.3						
13	0.09	0.61	98.9						
14	0.08	0.51	99.4						
15	0.05	0.36	99.8						
16	0.02	0.17	100.0						

Note. Extraction Method: Principal Component Analysis. Comp = Component, Var.= Variance, Cumul = Cumulative, Sq = Square

The three-component solution met the interpretability criterion. As such, three components were retained. Varimax orthogonal rotation was employed to help interpret the results. The rotated solution in Table 19 exhibited simple structure as recommended by Thurstone (1947).

Table 19

Rotated Component Matrix from PCA with Varimax Rotation

UTAUT Items	Component 1	2	3
bI1	**0.820**	0.381	0.029
bi2	**0.837**	0.429	0.039
bi3	**0.839**	0.412	0.052
pe1	**0.741**	0.399	0.337
pe2	**0.625**	0.423	0.464
pe3	**0.678**	0.462	0.381
ee1	**0.785**	0.022	0.373
ee2	**0.789**	0.046	0.366
ee3	**0.795**	-0.048	0.360
si1	0.213	**0.870**	0.077
si2	0.263	**0.836**	0.210
si3	0.237	**0.537**	0.670
fc1	0.370	0.270	**0.797**
fc2	0.679	0.043	**0.451**
fc3	0.127	-0.323	**0.445**
fc4	0.103	0.108	**0.470**

Note. a. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
b. Rotation converged in 7 iterations.

Non-Parametric and Parametric Tests

Spearman's Rank-Order Correlation

The Spearman's rank-order correlation or Spearman *rho* is a non-parametric test that measures the strength and direction of the relationship between two variables on an ordinal or continuous scale (Laerd Statistics, 2015e). To evaluate the degree of monotonicity in the relationship between BI and the predictor constructs, PE, EE, SI and FC, monotonic functions were fitted to the sorted data of BI against the constructs as shown in the scree plots in Figures 15-18. The fit of the monotonic function, measured with the R^2 coefficient, was used as a measure of the degree of monotonicity between the variables. In all the cases, acceptable evidence of a monotonic relationship was found, suggesting that the assumption of monotonicity is satisfied: The results, as shown with the scatterplots in Figures 15-18, indicate that the highest monotonic relation is between BI-PE (R^2= .6) and between BI-EE (R^2= .4), but in contrast the relationship of BI with SI and FC is less monotonic (R^2 = .32 and R^2 = .34, respectively).

The results of the Spearman rho tests indicated significant relationships between the UTAUT variables, where correlations between BI and PE is .746, BI and EE is .587, BI and SI is .569, and BI and FC is .613. All correlations are significant at the 0.01 level (2-tailed). I will discuss the results from these tests in the Research Questions and Hypotheses section.

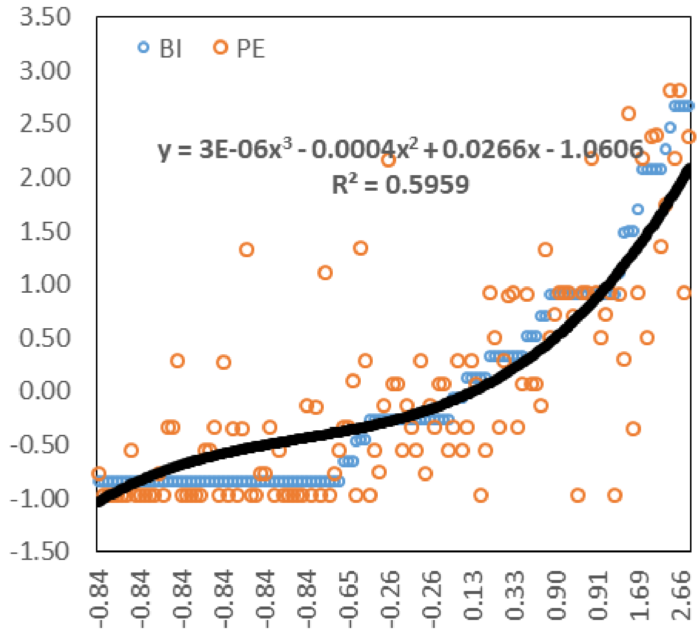

*Figure 15.*Scatterplot showing correlation of BI with PE.

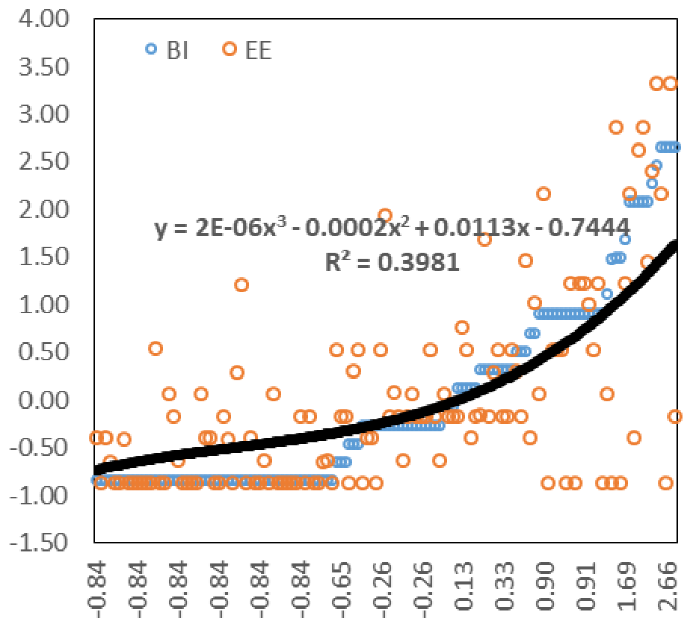

Figure 16 Scatterplot showing correlation of BI with EE.

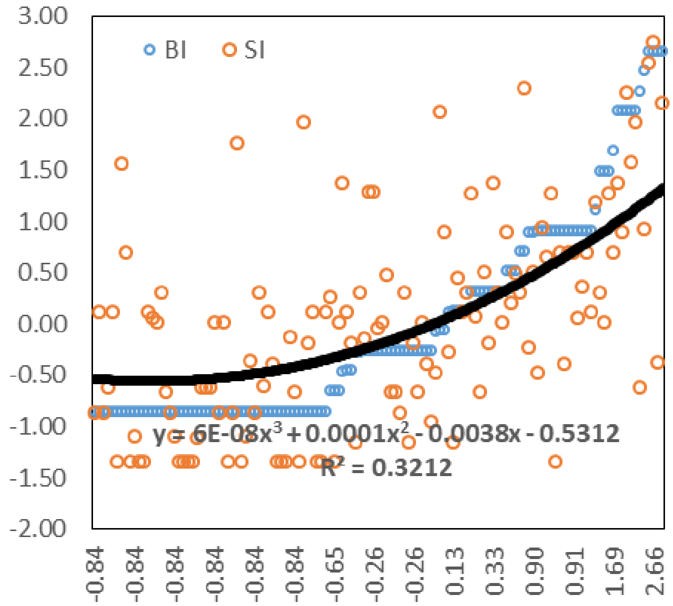

Figure 17. Scatterplot showing correlation of BI with SI.

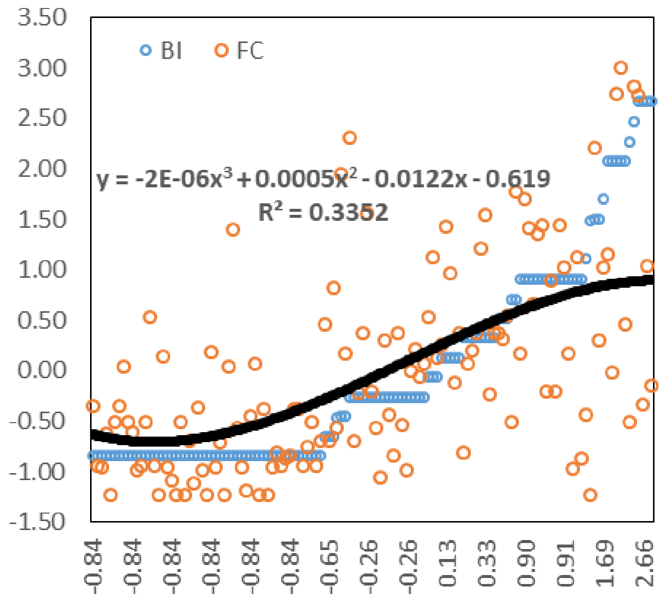

Figure 18. Scatterplot showing correlation of BI with FC.

Pearson Correlation

A Pearson product-moment correlation coefficient test was performed to measure the strength of linear relationship between BI and PE, EE, SI, and FC. The Pearson correlation coefficient, *r*, has a range of values from +1 to -1 with values at zero indicating no relationship, values greater than zero indicating positive relationship, and values less than zero indicating negative relationship (Laerd Statistics, 2015f).

The items in the survey, bi1, bi2, and bi3, pe1, pe2, and pe3, ee1, ee2, and ee3, si1, si2, and si3, and fc1, fc2, fc3, and fc4 were combined under BI, PE, EE, SI, and FC respectively as scale variables that can be suitably analyzed through Pearson correlation. I will discuss the results from these tests in the Research Questions and Hypotheses section.

RQ1: What is the relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$1: There is no relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a1: There is a relationship between PE and BI to use collaborative cloud computing applications for grading and feedback purposes.

Pearson correlation results indicated that there was a strong, positive correlation between BI and PE, $r = 0.781$, $p < .01$ (See Table 20). Therefore, the null hypothesis of no correlation can be rejected indicating that a relationship exists between PE and BI.

Table 20

Pearson Correlation for Performance Expectancy

		behavioral intent (BI)	performance expectancy (PE)
behavioral intent (BI)	Pearson Correlation	1	.781**
	Sig. (2-tailed)		0.000
	N	129	129
performance expectancy (PE)	Pearson Correlation	.781**	1
	Sig. (2-tailed)	0.000	
	N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

Spearman's rho correlation also indicated strong positive correlation between PE and BI, $r_s = 0.746$, $p < .01$ (See Table 21). Therefore, the null hypothesis of no correlation can be rejected, indicating that a relationship exists between PE and BI.

Table 21

Spearman Correlation for Performance Expectancy and Behavioral Intent

			behavioral intent (BI)	performance expectancy (PE)
Spearman's rho	behavioral intent (BI)	Correlation Coefficient	1.000	.746**
		Sig. (2-tailed)		0.000
		N	129	129
	performance expectancy (PE)	Correlation Coefficient	.746**	1.000
		Sig. (2-tailed)	0.000	
	performance expectancy (PE)	N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

RQ2: What is the relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$2: There is no relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a2: There is a relationship between EE and BI to use collaborative cloud computing applications for grading and feedback purposes.

Pearson Correlation results indicated there was a strong, positive correlation between BI and effort expectancy, $r = .646$, $p < .01$ (See Table 22). Therefore, the null hypothesis of no correlation can be rejected indicating that a relationship exists between EE and BI.

Table 22

Pearson Correlation for Effort Expectancy and Behavioral Intent

		behavioral intent (BI)	effort expectancy (EE)
behavioral intent (BI)	Pearson Correlation	1	.646**
	Sig. (2-tailed)		0.000
	N	129	129
effort expectancy (EE)	Pearson Correlation	.646**	1
	Sig. (2-tailed)	0.000	
	N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

Spearman correlation results indicated there was a strong, positive correlation between EE and BI, $r_s = 0.587$, $p < .01$ (See Table 23). Therefore, the null hypothesis of no correlation can be rejected, indicating that a relationship exists between EE and BI.

Table 23

Spearman Correlations for Effort Expectancy and Behavioral Intent

			behavioral intent (BI)	effort expectancy (EE)
Spearman's rho	behavioral intent (BI)	Correlation Coefficient	1.000	.587**
		Sig. (2-tailed)		0.000
		N	129	129
	effort expectancy (EE)	Correlation Coefficient	.587**	1.000
		Sig. (2-tailed)	0.000	
		N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

RQ3: What is the relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0 3$: There is no relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

$H_a 3$: There is a relationship between SI and BI to use collaborative cloud computing applications for grading and feedback purposes.

Pearson Correlation results indicated that there was a strong, positive correlation between SI and BI, $r = 0.579$, $p < .01$ (See Table 24). Therefore, the null hypothesis of no correlation can be rejected indicating that a relationship exists between SI and BI.

Table 24

Pearson Correlation for Social Influence and Behavioral Intent

		behavioral intent (BI)	social influence (SI)
behavioral intent (BI)	Pearson Correlation	1	.579**
	Sig. (2-tailed)		0.000
	N	129	129
social influence (SI)	Pearson Correlation	.579**	1
	Sig. (2-tailed)	0.000	
	N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

Spearman Correlation results indicated there was a strong positive correlation between SI and BI, $r_s = 0.569$, $p < .01$ (See Table 25). Therefore, the null hypothesis of no correlation can be rejected indicating that a relationship exists between SI and BI.

Table 25

Spearman Correlation for Social Influence and Behavioral Intent

			behavioral intent (BI)	social influence (SI)
Spearman's rho	behavioral intent (BI)	Correlation Coefficient	1.000	.569**
		Sig. (2-tailed)		0.000
		N	129	129
	social influence (SI)	Correlation Coefficient	.569**	1.000
		Sig. (2-tailed)	0.000	
		N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

RQ4: What is the relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes?

$H_0$4: There is no relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

H_a4: There is a relationship between FC and BI to use collaborative cloud computing applications for grading and feedback purposes.

Pearson correlation results indicated that there was a strong, positive correlation between FC and BI, $r = .570$, $p < .01$ (See Table 26). Therefore, the null hypothesis of no correlation can be rejected indicating that a relationship exists between FC and BI.

Table 26

Pearson Correlation for Facilitating Conditions and Behavioral Intent

		behavioral intent (BI)	facilitating conditions (FC)
behavioral intent (BI)	Pearson Correlation	1	.570**
	Sig. (2-tailed)		0.000
	N	129	129
facilitating conditions (FC)	Pearson Correlation	.570**	1
	Sig. (2-tailed)	0.000	
	N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

Spearman correlation results, $r_s = 0.613$, $p < .01$ indicated a strong correlation between FC and BI (See Table 27). Therefore, the null hypothesis of no correlation can be rejected, indicating that a relationship exists between FC and BI.

Table 27

Spearman Correlation for Facilitating Conditions and Behavioral Intent

			behavioral intent (BI)	facilitating conditions (FC)
Spearman's rho	behavioral intent (BI)	Correlation Coefficient	1.000	.613**
		Sig. (2-tailed)		0.000
		N	129	129
	facilitating conditions (FC)	Correlation Coefficient	.613**	1.000
		Sig. (2-tailed)	0.000	
		N	129	129

Note. **Correlation is significant at 0.01 level (2-tailed)

Simple Linear Regression

I performed a simple linear regression to examine the moderating effects of age (survey questions 5 to 8), the moderator effects of gender (survey questions 9-12), the moderating effects of experience with similar collaborative cloud computing tools such as Google Drive, OneDrive, and Dropbox (survey questions 13-16) and the moderating effects of voluntariness of use of collaborative cloud computing tools at the participants' school sites (survey questions 17-20). The simple linear regression is a good fit for this study's data set because of the linear relationships of the paired observations and the continuous or interval levels of the variables measured.

There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.177 (See Table 28). Since the observed variables in this data set are paired or bivariate, with one dependent and one independent variable, there is no issue of homoscedasticity. The R^2 value of the estimated regression of 67% is an acceptable fit for this model.

Table 28

Overall Durbin-Watson Test Results for BI and UTAUT Predictors with UTAUT Moderators

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.818[a]	0.669	0.625	0.61344024	2.177

Note. a. Predictors: (Constant), vu, d_exp_4to6, d_age_51more, d_exp_10to12, d_genwom, facilitating conditions (FC), d_age_26to30, d_exp_13to15, d_exp_7to9, d_age_41to50, social influence (SI), effort expectancy (EE), performance expectancy (PE), d_exp_1to3, d_age_31to40
b. Dependent Variable: behavioral intent (BI)

The collinearity statistics in Table 29 show that multicollinearity is not severe in the variables relevant for the analysis PE, EE, SI, and FC. The test results indicated that the male participants appear to have a slightly higher BI compared to that of the female participants since the variable gender is statistically significant at the 10% but not at the 5% level. The interpretations of the results of the linear regression are discussed in Chapter 5.

Table 29

Overall Linear Regression Results for Behavioral Intent and UTAUT Predictors with UTAUT Moderators

		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-0.891	0.526		-1.695	0.093					
	PE	0.584	0.102	0.585	5.731	0.000	0.781	0.476	0.312	0.284	3.527
	EE	0.224	0.091	0.225	2.478	0.015	0.645	0.228	0.135	0.359	2.785
	SI	0.132	0.080	0.132	1.659	0.100	0.577	0.155	0.090	0.465	2.150
	FC	-0.041	0.087	-0.041	-0.472	0.638	0.570	-0.045	-0.026	0.392	2.553
	d_age_26to30	0.388	0.403	0.118	0.963	0.337	0.047	0.091	0.052	0.198	5.042
	d_age_31to40	0.225	0.372	0.107	0.606	0.546	-0.132	0.057	0.033	0.095	10.492
	d_age_41to50	0.069	0.380	0.030	0.181	0.857	-0.010	0.017	0.010	0.109	9.203
	d_age_51more	0.217	0.379	0.099	0.574	0.567	0.119	0.054	0.031	0.100	10.020
	d_gen	0.262	0.144	0.106	1.817	0.072	0.032	0.169	0.099	0.870	1.150
	d_exp_1to3	0.415	0.337	0.205	1.233	0.220	0.169	0.116	0.067	0.107	9.366
	d_exp_4to6	0.509	0.348	0.236	1.463	0.146	-0.019	0.137	0.080	0.113	8.837
	d_exp_7to9	0.251	0.364	0.095	0.688	0.493	-0.170	0.065	0.037	0.156	6.430
	d_exp_10to12	0.126	0.507	0.019	0.248	0.804	-0.062	0.023	0.014	0.500	2.002
	d_exp_13to15	0.521	0.433	0.110	1.205	0.231	-0.124	0.113	0.066	0.352	2.844
	Vu	0.019	0.029	0.040	0.658	0.512	0.216	0.062	0.036	0.816	1.225

Note: a. Dependent Variable: behavioral intent (BI)

Dependent and independent variables moderated by age. A linear regression was run to understand the effect on BI by PE, EE, SI, and FC, when moderated by age. The equation for the linear regression is BI = -1.19 + .58*PE + .27*EE + .123*SI - .047*FC + .353*age_26to30 + .169*age_31to40 - .38*age_41to50 + .134*age_51more resulting to r^2 of 0.621. The results indicate that age is a significant moderator on K-12 teachers' BI to use collaborative cloud computing among K-12 teachers. The overall regression results indicated that PE and EE are strong predictors of K-12 teachers' BI to use collaborative cloud computing for grading and feedback purposes. The regression results are shown in Table 30.

Table 30

Linear Regression Results for Behavioral Intent and UTAUT Predictors when Moderated by Age

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-0.119	0.357		-0.334	0.739					
	PE	0.580	0.100	0.581	5.788	0.000	0.781	0.469	0.316	0.296	3.378
	EE	0.226	0.089	0.226	2.531	0.013	0.645	0.226	0.138	0.374	2.673
	SI	0.123	0.075	0.123	1.644	0.103	0.577	0.149	0.090	0.534	1.872
	FC	-0.047	0.085	-0.047	-0.551	0.583	0.570	-0.050	-0.030	0.408	2.451
	d_age_26to30	0.353	0.398	0.107	0.887	0.377	0.047	0.081	0.048	0.205	4.876
	d_age_31to40	0.169	0.369	0.080	0.459	0.647	-0.132	0.042	0.025	0.097	10.259
	d_age_41to50	-0.038	0.374	-0.017	-0.102	0.919	-0.010	-0.009	-0.006	0.113	8.840
	d_age_51more	0.134	0.371	0.061	0.361	0.719	0.119	0.033	0.020	0.105	9.523

Note: a. Dependent Variable: behavioral intent (BI)

The r^2 value in Table 31 indicates how much of the total variation in BI can be explained by the PE, EE, SI, and FC. In this case, 64.5% of the total variation can be explained by PE, EE, SI, and FC.

Table 31

Durbin Watson Results for Behavioral Intent and UTAUT Predictors when Moderated by Age.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.803[a]	0.645	0.621	0.61607687	2.153

Note. a. Predictors: (Constant), d_age_51more, social influence (SI), d_age_26to30, d_age_41to50, effort expectancy (EE), facilitating conditions (FC), performance expectancy (PE), d_age_31to40

RQ5: To what extent does the moderator age moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$5: Age does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a5: Age moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for PE and BI when moderated by age is t (-.119) = 5.788, $p < .01$. Based on these results, the null hypothesis of no relationship between PE and BI, moderated by age, can be rejected at conventional significance levels of less than 1%, indicating that a relationship exists between PE and BI, even after age was moderated.

RQ6: To what extent does moderator age moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$6: Age does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a6: Age moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for EE and BI when moderated by age is t (-.119) = 2.531, $p < .05$ Based on these results, the null hypothesis of no relationship between EE and BI, moderated by age, can be rejected at conventional significance levels of less than 1%, indicating that a relationship exists between EE and BI, even after age was moderated.

RQ7: To what extent does moderator age moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$7: Age does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a7: Age moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for SI and BI when moderated by age is t (-0.119) = 1.644, $p = 0.103$. Based on these results, the null hypothesis of no relationship between SI and BI, moderated by age, cannot be rejected at conventional significance levels, indicating that the role of age on intent to use collaborative cloud computing for grading and feedback purposes and SI is not significant.

RQ8: To what extent does moderator age moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$8: Age does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a8: Age moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for FC and BI when moderated by age is t (- .119) = -.551, p = 0.583. Based on these results, the null hypothesis of no relationship between K-12 teachers' FC and BI, moderated by age, cannot be rejected at conventional significance levels, indicating that a relationship does not exist between K-12 teachers' FC and BI, even after age was moderated.

Dependent and independent variables moderated by gender. A linear regression was run to understand the effect on BI by PE, EE, SI, and FC, when moderated by gender. The equation was BI = -.224 + .576*PE + .203*EE + .158*SI - .056*FC + .285*gen. A significant regression was found. The regression results are shown in Table 32.

Table 32

Linear Regression Results for Behavioral Intent and UTAUT Predictors when Moderated by Gender

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.	Correlations Zero-order	Correlations Partial	Correlations Part	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	-0.224	0.121		-1.852	0.066					
	PE	0.576	0.098	0.577	5.855	0.000	0.781	0.468	0.316	0.299	3.344
	EE	0.203	0.086	0.204	2.366	0.020	0.645	0.209	0.128	0.391	2.554
	SI	0.158	0.074	0.158	2.134	0.035	0.577	0.190	0.115	0.529	1.889
	FC	-0.056	0.083	-0.056	-0.670	0.504	0.570	-0.061	-0.036	0.419	2.385
	d_gen	0.285	0.136	0.115	2.095	0.038	0.032	0.186	0.113	0.965	1.037

Note: a. Dependent Variable: behavioral intent (BI)

The r^2 value in Table 33 indicates how much of the total variation in BI can be explained by PE, EE, SI, FC. In this case, 64.5% can be explained.

Table 33

Durbin Watson Results for Behavioral Intent and UTAUT Predictors when Moderated by Gender

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.803[a]	0.645	0.631	0.60829984	2.131

a. Predictors: (Constant), d_gen, facilitating conditions (FC), social influence (SI), effort expectancy (EE), performance expectancy (PE)
b. Dependent Variable: behavioral intent (BI)

RQ9: To what extent does moderator gender moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0 9$: Gender does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

$H_a 9$: Gender moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for PE and BI when moderated by gender is t (-0.224) = 5.855, $p < .01$. Based on these results, the null hypothesis of no relationship between PE and BI, moderated by gender, can be rejected at conventional significance levels of less than 1%, indicating that a relationship exists between PE and BI, even after age was moderated.

RQ10: To what extent does moderator gender moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$10: Gender does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a10: Gender moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for EE and BI when moderated by gender is t (-0.224) = 2.366, $p < .05$ Based on these results, the null hypothesis of no relationship between K-12 teachers' EE and BI, moderated by gender, can be rejected at conventional significance levels of 5% but not at 1%, indicating that a relationship exists between K-12 teachers' EE and BI, even after gender was moderated.

RQ11: To what extent does moderator gender moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$11: Gender does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a11: Gender moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for SI and BI when moderated by gender is t (-0.225) = 2.134 $p < .05$. Based on these, the null hypothesis of no relationship between K-12 teachers' SI and BI, moderated by gender, can be rejected at conventional significance levels of 5% but not at 1%, indicating that a relationship exists between K-12 teachers' SI and BI, even after gender was moderated.

RQ12: To what extent does moderator gender moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$12: Gender does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a12: Gender moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for FC and BI when moderated by gender is t (-0.225) = -.670, p =.504. Based on these results below, the null hypothesis of no relationship between K-12 teachers' FC and BI, moderated by gender, cannot be rejected at conventional significance levels, suggesting that a relationship does not exist between FC and BI, even after gender was moderated.

Dependent and independent variables moderated by experience. A linear regression was run to understand the effect on BI by PE, EE, SI, and FC, when moderated by number of years of experience using collaborative cloud computing for grading and feedback purposes. The equation was BI = -.398 + .588*PE + .205*EE + .129*SI - .035*FC + .422*d_exp_13to15, .489*exp_10to12, .267*exp_7to9, .087*exp_4to6, PE, EE, SI, and FC + .522*d_exp_1to3. A significant regression was found. The regression results are shown in Table 34.

Table 34

Regression Results for Behavioral Intent and UTAUT Predictors when Moderated by Experience

		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	Model	B	Std. Error	Beta	T	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-0.398	0.330		-1.204	0.231					
	PE	0.588	0.101	0.588	5.798	0.000	0.781	0.469	0.315	0.288	3.476
	EE	0.205	0.088	0.205	2.321	0.022	0.646	0.208	0.126	0.379	2.636
	SI	0.129	0.075	0.129	1.711	0.090	0.579	0.155	0.093	0.522	1.917
	FC	-0.035	0.086	-0.035	-0.411	0.682	0.570	-0.038	-0.022	0.404	2.477
	d_exp_1to3	0.422	0.337	0.208	1.254	0.212	0.174	0.114	0.068	0.107	9.339
	d_exp_4to6	0.489	0.348	0.227	1.406	0.162	-0.015	0.128	0.077	0.114	8.798
	d_exp_7to9	0.267	0.362	0.101	0.737	0.463	-0.166	0.067	0.040	0.158	6.321
	d_exp_10to12	0.087	0.462	0.015	0.188	0.851	-0.091	0.017	0.010	0.457	2.187
	d_exp_13to15	0.522	0.430	0.110	1.215	0.227	-0.122	0.111	0.066	0.359	2.789

Note: a. Dependent Variable: behavioral intent (BI)

The r^2 value in Table 35 indicates how much of the total variation in BI can be explained by PE, EE, SI, and FC can be explained. In this case, 64.8% can be explained.

Table 35

Durbin Watson Results for Behavioral Intent and UTAUT Predictors when Moderated by Experience

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.805[a]	0.648	0.621	0.61565928	2.180

a. Predictors: (Constant), d_exp_13to15, d_exp_10to12, d_exp_7to9, social influence (SI), d_exp_4to6, effort expectancy (EE), facilitating conditions (FC), performance expectancy (PE), d_exp_1to3
b. Dependent Variable: behavioral intent (BI)

RQ13: To what extent does moderator experience moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$13: Experience does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a13: Experience moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for PE and BI when moderated by experience is t (-0.398) = 5.798, $p < .01$. Based on these results, the null hypothesis of no relationship between K-12 teachers' PE and BI, moderated by experience, can be rejected at conventional significance levels of less than 1%, indicating that a relationship exists between PE and BI, even after moderated by experience.

RQ14: To what extent does moderator experience moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$14: Experience does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a14: Experience moderates the relationship between K-12 EE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for EE and BI when moderated by gender is t (-0.398) = 2.321, p <.05 Based these results, the null hypothesis of no relationship between K-12 teachers' EE and BI, moderated by experience, can be rejected at conventional significance levels of 5% but not at 1%, indicating that a relationship exists between EE and BI, even after moderated by experience.

RQ15: To what extent does moderator experience moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$15: Experience does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a15: Experience moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for SI and BI when moderated by gender is t (-0.398) = 1.711, p = .090. Based on these results, the null hypothesis of no relationship between K-

12 teachers' SI and BI, moderated by experience, cannot be rejected at conventional significance levels, indicating that a relationship does not exist between SI and BI, even after moderated by experience.

RQ16: To what extent does moderator experience moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$16: Experience does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a16: Experience moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results for FC and BI when moderated by gender is t (-0.398) = -.411, p =.682. Based on these results, the null hypothesis of no relationship between K-12 teachers' FC and BI, moderated by experience, cannot be rejected at conventional significance levels, indicating that a relationship does not exist between FC and BI, even after moderated by experience.

Dependent and independent variables moderated by voluntariness of use. A linear regression was run to understand the effect on BI by PE, EE, SI, and FC, when moderated by VU. The equation was BI = t (.014) + .576*PE + .203*EE + .133*SI - .044*FC + .003*vu. A significant regression was found. The results of the regression are in Table 36.

.

Table 36

Linear Regression Results for Behavioral Intent and UTAUT Predictors when Moderated by Voluntariness of Use

		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-0.014	0.140		-0.099	0.922					
	PE	0.576	0.100	0.576	5.746	0.000	0.781	0.460	0.314	0.297	3.369
	EE	0.203	0.087	0.203	2.323	0.022	0.646	0.205	0.127	0.391	2.557
	SI	0.133	0.076	0.133	1.749	0.083	0.579	0.156	0.095	0.515	1.943
	FC	-0.044	0.084	-0.044	-0.526	0.600	0.570	-0.047	-0.029	0.418	2.392
	vu	0.003	0.028	0.006	0.107	0.915	0.210	0.010	0.006	0.890	1.124

a. Dependent Variable: behavioral intent (BI)

The R^2value in Table 37 indicates how much of the total variation in BI can be explained by PE, EE, SI, and FC when moderated by VU. In this case, 63.4% can be explained.

Table 37

Durbin-Watson Results for Behavioral Intent and UTAUT Predictors when Moderated by Voluntariness of Use

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.796[a]	.634	.619	.61755966	2.112

Note. a. Predictors: (Constant), vu, facilitating conditions (FC), social influence (SI), effort expectancy (EE), performance expectancy (PE) b. Dependent Variable: behavioral intent (BI)

RQ17: To what extent does moderator VU moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$17: VU does not moderate the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a17: VU moderates the relationship between K-12 teachers' PE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results between PE and BI when moderated by VU is t (-.014) = 5.746, $p < .01$. Based on these results, the null hypothesis of no relationship between K-12 teachers' PE and BI, moderated by experience, can be rejected at conventional significance levels of less than 1%, indicating that a relationship does exist between PE and BI, even after moderated by VU.

RQ18: To what extent does moderator VU moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$18: VU does not moderate the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

H_a18: VU moderates the relationship between K-12 teachers' EE and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results between EE and BI when moderated by VU is t (-.014) = 2.323, p <.05. Based on these results, the null hypothesis of no relationship between K-12 teachers' EE and BI, moderated by VU, can be rejected at conventional significance levels of 5% but not at 1%, indicating that a relationship exists between EE and BI, even after moderated by VU.

RQ19: To what extent does moderator VU moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$19: VU does not moderate the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

H_a19: VU moderates the relationship between K-12 teachers' SI and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results between SI and BI when moderated by VU is t (-.014) = 1.749, p =.083. Based on these results, the null hypothesis of no relationship between K-

12 teachers' SI and BI, moderated by VU, cannot be rejected at conventional significance levels of 5% and 1%, indicating that a relationship does not exist between SI and BI, even after moderated by VU.

RQ20: To what extent does moderator VU moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes?

$H_0$20: VU does not moderate the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

H_a20: VU moderates the relationship between K-12 teachers' FC and BI to use collaborative cloud computing for grading and feedback purposes.

The regression results between FC and BI when moderated by VU is t (-.014) = -.526, p = .600. Based on these results, the null hypothesis of no relationship between K-12 teachers' FC and BI, moderated by experience, cannot be rejected at conventional significance levels, indicating that a relationship does not exist between FC and BI, even after moderated by VU.

Path Analysis

Figure 19 serves as the path analysis for this study. The simple linear regression results indicated that PE and EE are strong predictors of BI when moderated by age and gender but not when moderated by experience, and VU. SI is a strong predictor of BI when moderated by gender but not when moderated by age, experience, and VU. PE, EE, and FC are not predictors of BI when moderated by age, gender, experience, and VU. Further discussions on the results of this study's simple linear regression are in Chapter 5.

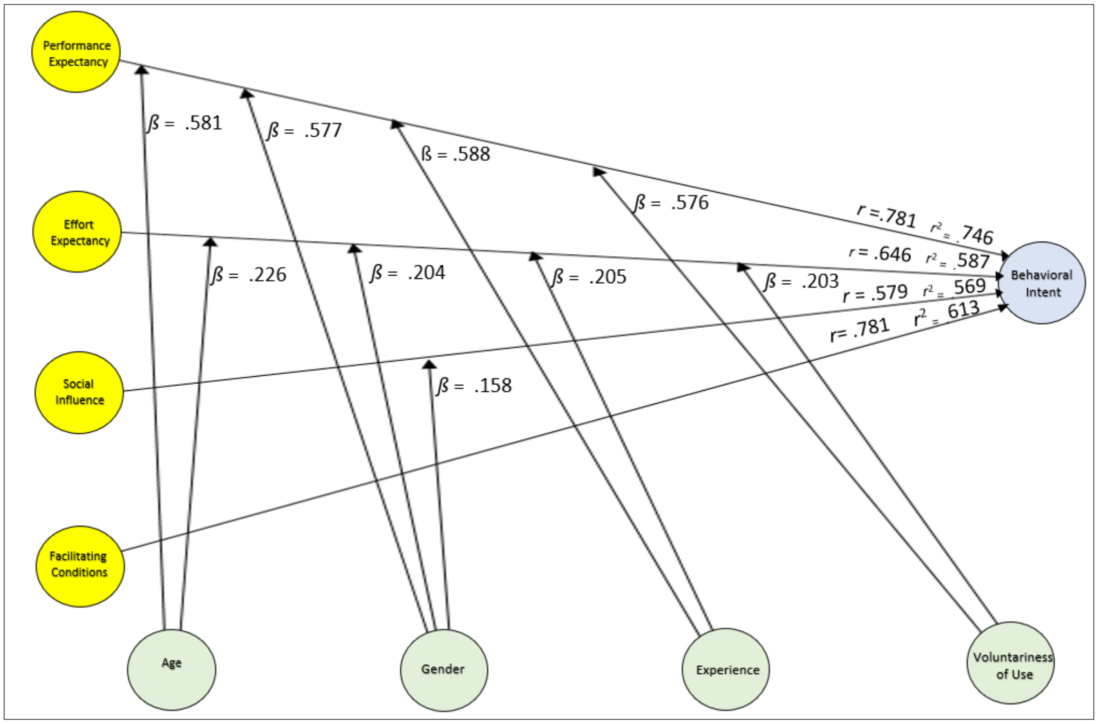

Figure 19. Path Analysis Model for This Study's Statistical Tests Results

Summary

This chapter discussed the findings of the study. Data preparation and cleaning include analyzing the missing data which were 5% of the data set through mode imputation. A PCA was performed to reduce the number of correlated components, resulting to three factor loadings. Statistical tests to measure the strength and direction of relationships between BI and PE, EE, SI, and FC were performed including Pearson correlation, Spearman correlation, and simple linear regression.

Results from Pearson and Spearman's correlations indicated that relationships exist between PE and BI, EE and BI, SI and BI, and FC and BI. Simple linear regression results indicated that positive relationships exist between PE and BI, EE and BI, SI and BI, and FC and BI when moderated by age but not when moderated by experience and VU. The regression results also indicated that gender moderates the relationships between PE and BI, EE and BI, and SI and BI but not the relationship between FC and BI. In the case of FC, the result could be related to the limitations in the measurement of this concept which will be discussed in Chapter 5. Compared to female participants, male participants were found to have a slightly higher BI to use collaborative cloud computing for grading and feedback purposes.

Chapter 5: Discussion, Conclusion, and Recommendations

The purpose of this study was to determine if Venkatesh et al.'s (2003) UTAUT constructs, which are performance expectancy, effort expectancy, social influence, and facilitating conditions, are strong predictors of behavioral intent to use collaborative cloud computing for grading and feedback purposes among K-12 teachers. This study also examined whether age, gender, experience, and voluntariness of use are significant moderators between UTAUT's predictor variables and behavioral intent to use collaborative cloud computing for grading and feedback purposes.

UTAUT Model

Venkatesh et al. (2003) developed the UTAUT model based on eight other technology acceptance models: a) Theory of reasoned action (TRA), b) Theory of planned behavior (TPB), c) Technology acceptance model (TAM), d) Combined technology acceptance and Theory of planned behavior (C-TAM-TPB), e) Model of PC utilization (MPCU), f) Diffusion of innovation (DOI), and Socio-cognitive theory. The model has four predictor variables: a) PE, b) EE, c) SI, and d) FC. BI and UB towards technology were the criterion variables. The developers established the model's four moderating variables of age, gender, experience, and VU and the extent to which they influence the relationships of the predictor variables and the criterion variables. Venkatesh et al. hypothesized that age, gender and experience are significant moderators for predicting the relationships between PE and BI, EE and BI, and SI and BI.

Additionally, it was established that age and experience are strong moderators for FC and UB.

The UTAUT model proves to be beneficial in examining the likelihood that individuals use new technology. In Venkatesh et al.'s (2003) study, it allowed business managers to assess if potential users are more likely to adopt cloud computing. If users are less likely to use new technologies, the model serves as a proactive tool to determine the psychology behind their BI to use and UB towards new technologies. In this study, I excluded UB from the model. The rationale for excluding UB is explained below.

Exclusion of Use Behavior

FC was a determinant for BI and UB; however, UB is not included in this study's model. Although self-reported constructs such as UB could have significant impact on scientific and experimental research, there are potential problems for measuring them in social science, nonexperimental research. First, it is challenging to measure the introspect ability of the respondents even when they try to be honest with their answers (Austin et al., 1998). Second, Austin et al. (1998) explained that the rating scales to measure self-reported constructs may be too restrictive in a *yes* or *no* response or too broad in 5-7-point Likert-type scales. Both types of scales may be interpreted by individuals in various ways. Finally, individuals can either be extreme responders or be always ready to agree or disagree and have the tendency to select answers located at the front edge or the last edge of the scales, or they may be indecisive and often choose the midpoints or the neutral answers of the scale (Fan et al., 2006).

Validity of the UTAUT Model

I analyzed the correlations among the constructs. The factor loadings from the PCA with Varimax rotation are shown in Table 38 where the highest score is at 0.870. Overall, the UTAUT model fared well with the sample population of this study.

Table 38

PCA Results with Varimax Rotation

UTAUT Items	Component 1	2	3
bi1	**0.820**	0.381	0.029
bi2	**0.837**	0.429	0.039
bi3	**0.839**	0.412	0.052
pe1	**0.741**	0.399	0.337
pe2	**0.625**	0.423	0.464
pe3	**0.678**	0.462	0.381
ee1	**0.785**	0.022	0.373
ee2	**0.789**	0.046	0.366
ee3	**0.795**	-0.048	0.360
si1	0.213	**0.870**	0.077
si2	0.263	**0.836**	0.210
si3	0.237	**0.537**	0.670
fc1	0.370	0.270	**0.797**
fc2	0.679	0.043	**0.451**
fc3	0.127	-0.323	**0.445**
fc4	0.103	0.108	**0.470**

Note. a. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. b. Rotation converged in 7 iterations.

Reliability of the UTAUT Model

I measured the UTAUT constructs using Cronbach's Alpha to analyze the independence of the constructs of the UTAUT model. Every construct in the model shows a high level of reliability coefficient and internal consistency. Venkatesh et al.

(2003) explained that a coefficient of 0.70 is generally reliable. The constructs' Cronbach's alpha measures are as follows: pe1 (0.892), pe2 (0.892), pe3 (0.892), ee1 (0.896), ee2 (0.896), ee3 (0.897), si1 (0.900), si2 (0.898), si3 (0.897), fc1, (0.897), fc2 (0.897), fc3 (0.917), fc4 (0.909), bi1 (0.894), bi2 (0.893), and bi3 (0.893). These reliability values demonstrate that the high internal consistency of the UTAUT model can be accepted in the adoption of collaborative cloud computing for grading and feedback purposes among K-12 teachers.

This applicability of the UTAUT model in educational settings was also confirmed in Ling, Ahmad, and Singh's (2016) study of Malaysian teachers wherein the UTAUT Cronbach's alpha coefficient values were PE (0.821), EE (0.824), SI (0.854), FC (0.775), and BI (0.885).

Study Findings

The sample for this study is representative of the K-12 teachers in the Pacific Coast region of the United States. Table 39 shows the age group distribution of K-12 teachers in the region. The report was reviewed in July 2017.

Table 39

California Public School Teachers' Age Group Distribution for the 2015–16 School Year

Age Group	Number of Teachers	Percentage of Teachers
Over 55	66,580	18.90%
46 to 55	91,371	25.90%
Under 46	194,648	55.20%
Not reported	0	0.00%
Total	352,599	100.00%

Note. Acquired from the CalEd Facts website from the California Department of Education

For this study's sampling population, 43%, 29%, and 25% of the participants belong in the 30-40-year-old, 51+ year old, and 41-50-year-old age groups respectively, and only 2% of the participants belong in the 21-25-year-old age group. A 2003-2004 report from the National Center of Educational Statistics indicated that the gender distribution of the region's teaching population was 72% female and 28% male teachers. The gender distribution of this study's sample, 80% female and 20% male teachers, is also representative of the region's teaching population.

The purpose of this quantitative study was to determine if Venkatesh et al.'s (2003) UTAUT constructs are strong predictors of K-12 teachers' intent to use collaborative cloud computing for grading and feedback purposes. I examined PE, EE, SI, and FC to determine if each of these constructs are correlated with BI to use collaborative cloud computing tools for grading and feedback purposes by performing Pearson and Spearman's correlations. I performed a simple linear regression to examine if gender, age, experience, and VU are strong moderators for PE, EE, SI, FC, and BI to use collaborative cloud computing for grading and feedback purposes. In this study, PE has the highest correlation with BI to use collaborative cloud computing for grading and feedback purposes, which is consistent with the UTAUT model.

Performance Expectancy

PE was significantly correlated with BI with a Pearson correlation value of r = 0.781 and a Spearman correlation value of $r^2 = 0.786$. This construct has the highest correlation with BI. Venkatesh et al. (2003) hypothesized that PE would have a significant relationship with BI when moderated by age and gender as well as have the highest correlation with BI. My study's findings supported these hypotheses.

For the first PE item in the survey, *"Using collaborative cloud computing tools for grading and feedback purposes is useful to my job,"* 75% of the participants completely agreed, mostly agreed, or somewhat agreed to this statement while 15% of the participants stayed neutral. For the second PE item in the survey, *"Using collaborative cloud computing tools for grading and feedback purposes enables me to accomplish my tasks quickly,"* 75% of the participants completely agreed, mostly agreed, or somewhat agreed to the statement while 13% remained neutral. For the final item of PE in the survey, *"Using collaborative cloud computing tools for grading and feedback purposes* *increases my productivity,"* 76% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 15% remained neutral.

Tables 40 to 42 represent the participants' responses to the PE items of the survey. Table 40 shows the participants' responses on the following statement: "*I find collaborative cloud computing tools for grading and feedback purposes useful in my job."* A majority of the participants agreed to this statement.

Table 40

Responses to the PE1 Item of the Survey

PE1: I find collaborative cloud computing tools for grading and feedback purposes useful in my job.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	51	39.5	39.8	39.8
	I mostly agree	35	27.1	27.3	67.2
	I somewhat agree	11	8.5	8.6	75.8
	I am neutral	19	14.7	14.8	90.6
	I somewhat disagree	3	2.3	2.3	93.0
	I mostly disagree	6	4.7	4.7	97.7
	I completely disagree	3	2.3	2.3	100.0
	Total	128	99.2	100.0	
Missing	System	1	0.8		
Total		129	100.0		

Note. Survey items from UTAUT questionnaire

Table 41 shows the participants' responses on the following statement: "*Using collaborative cloud computing tools for grading and feedback enables me to accomplish my task quickly."* A majority of the participants agreed to this statement.

Table 41

Responses to the PE2 Item of the Survey

PE2. Using collaborative cloud computing tools for grading and feedback enables me to accomplish my task quickly.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	49	38.0	38.0	38.0
	I mostly agree	26	20.2	20.2	58.1
	I somewhat agree	22	17.1	17.1	75.2
	I am neutral	17	13.2	13.2	88.4
	I somewhat disagree	3	2.3	2.3	90.7
	I mostly disagree	7	5.4	5.4	96.1
	I completely disagree	5	3.9	3.9	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

Table 42 shows the participants' responses on the following statement: "*Using collaborative cloud computing tools for grading and feedback increases my productivity.*" A majority of the participants agreed to this statement.

Table 42

Responses to the PE3 Item of the Survey

PE3. Using collaborative cloud computing tools for grading and feedback increases my productivity.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	40	31.0	31.0	31.0
	I mostly agree	30	23.3	23.3	54.3
	I somewhat agree	19	14.7	14.7	69.0
	I am neutral	20	15.5	15.5	84.5
	I somewhat disagree	9	7.0	7.0	91.5
	I mostly disagree	6	4.7	4.7	96.1
	I completely disagree	5	3.9	3.9	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

A simple linear regression was performed with age, gender, experience, and VU as moderators for PE and BI. For age, the standard coefficient is *ß* = 0.581, $p < .01$ indicating that age is a significant moderator when predicting BI with PE. For gender, the standard coefficient is *ß* = 0.577, $p < .01$, indicating that gender is a significant moderator when predicting BI with PE. For experience, the standard coefficient is *ß* = 0.588, $p < .01$, indicating that experience is a significant moderator when predicting BI with PE. For VU, the standard coefficient is significant, ß = 0.576, $p < .01$ indicating that VU is a significant moderator when predicting BI with PE. The UTAUT model hypothesized that age, gender, experience, and VU are significant moderators for BI and PE. This study supports these hypotheses.

Effort Expectancy

Venkatesh et al. (2003) hypothesized that EE is significantly correlated with BI. Findings for this current study support this hypothesis. EE was significantly correlated with BI with a Pearson correlation of $r = 0.646$ and a Spearman correlation of $r^s = 0.587$. For the first item under EE, *"It would be easy for me to become skillful at using collaborative cloud computing for grading and feedback purposes,"* 85% of the participants completely agreed, strongly agreed, and somewhat agreed to the statement while 6% remained neutral. The second EE item, *"I would find collaborative cloud computing tools for grading and feedback purposes easy to use,"* 81% completely agreed, mostly agreed, and somewhat agreed to the statement while 9% remain neutral. One participant skipped this item. For the third survey item under EE, *"Learning to operate collaborative cloud* *computing tools for grading and feedback purposes is easy for me,"* 78% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 9% chose to be neutral.

Tables 43-45 represent the participants' responses to the EE survey items. Table 43 shows the participants' responses on the following statement: "*It would be easy for me to become skillful at using collaborative cloud computing tools for grading and feedback purposes*." A majority of the participants agreed to this statement.

Table 43

Responses to the EE1 Item of the Survey

EE1. It would be easy for me to become skillful at using collaborative cloud computing tools for grading and feedback purposes.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	62	48.1	48.1	48.1
	I mostly agree	30	23.3	23.3	71.3
	I somewhat agree	17	13.2	13.2	84.5
	I am neutral	8	6.2	6.2	90.7
	I somewhat disagree	3	2.3	2.3	93.0
	I mostly disagree	6	4.7	4.7	97.7
	I completely disagree	3	2.3	2.3	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

Table 44 shows the participants' responses on the following statement: "*I would find collaborative cloud computing tools for grading and feedback easy to use."* A majority of the participants agreed to this statement.

Table 44

Responses to the EE2 Item of the Survey

EE2. I would find collaborative cloud computing tools for grading and feedback easy to use.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	47	36.4	36.7	36.7
	I mostly agree	43	33.3	33.6	70.3
	I somewhat agree	14	10.9	10.9	81.3
	I am neutral	12	9.3	9.4	90.6
	I somewhat disagree	3	2.3	2.3	93.0
	I mostly disagree	6	4.7	4.7	97.7
	I completely disagree	3	2.3	2.3	100.0
	Total	128	99.2	100.0	
Missing	System	1	0.8		
Total		129	100.0		

Note. Survey items from UTAUT questionnaire

Table 45 shows the participants' responses on the following statement: "*Learning to operate collaborative cloud computing tools for grading and feedback purposes is easy for me."* A majority of the participants agreed to this statement.

Table 45

Responses to the EE3 Items of the Survey

EE3. Learning to operate collaborative cloud computing tools for grading and feedback purposes is easy for me.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	50	38.8	38.8	38.8
	I mostly agree	38	29.5	29.5	68.2
	I somewhat agree	18	14.0	14.0	82.2
	I am neutral	12	9.3	9.3	91.5
	I somewhat disagree	4	3.1	3.1	94.6
	I mostly disagree	3	2.3	2.3	96.9
	I completely disagree	4	3.1	3.1	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

A simple linear regression was performed with the moderators of age, gender, experience, and VU. For age, the standard coefficient is significant, *ß* = 0.226, $p < 0.05$, indicating age is a significant moderator for BI with EE. For gender, the standard coefficient is *ß* = 0.204, $p < .05$, indicating gender is a significant moderator for BI and EE. For experience, the standard coefficient is *ß* = 0.205, $p < .05$, indicating that experience is a significant moderator for BI with EE. For VU, the standard coefficient is *ß* = 0.203, $p < .05$, indicating VU is a significant moderator for BI with EE. Venkatesh et al. (2003) hypothesized that age, gender, experience, and VU are strong moderators when predicting BI with EE. The findings of this study supported these hypotheses.

Social Influence

Venkatesh et al. (2003) hypothesized that social influence is significantly correlated with BI to use technology. Findings for this study supported this hypothesis. SI and BI were highly correlated with a Pearson correlation of $r = 0.579$ and a Spearman correlation of $r^2 = 0.569$. For the first item under social influence, *"People who influence my behavior think that I should use collaborative cloud computing for grading and feedback purposes,"* 58% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 27% stayed neutral. One participant skipped this item.

The second item under social influence, *"People who are important to me think that I should use collaborative cloud computing tools for grading and feedback purposes,"* 50% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 33% stayed neutral. The final item under social influence stated, *"In general, this school has supported the use of collaborative cloud computing tools for grading and feedback purposes,"* 76% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 11% stayed neutral. One participant skipped this item. Tables 46-48 represent the participants' responses to the social influence items of the survey. Table 46 shows the participants' responses on the following statement: "*People who influence my behavior think that I should use collaborative cloud computing tools for grading and feedback purposes."* A majority of the participants agreed with this statement.

Table 46

Responses to SI1 Item of the Survey

SI1. People who influence my behavior think that I should use collaborative cloud computing tools for grading and feedback purposes					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	25	19.4	19.5	19.5
	I mostly agree	26	20.2	20.3	39.8
	I somewhat agree	24	18.6	18.8	58.6
	I am neutral	35	27.1	27.3	85.9
	I somewhat disagree	7	5.4	5.5	91.4
	I mostly disagree	5	3.9	3.9	95.3
	I completely disagree	6	4.7	4.7	100.0
	Total	128	99.2	100.0	
Missing	System	1	0.8		
	Total	129	100.0		

Note. Survey items from UTAUT questionnaire

Table 47 shows the participants' responses to the following statement: "*People who are important to me think that I should use collaborative cloud computing tools for grading and feedback purposes."* A majority of the participants agreed to this statement.

Table 47

Responses to the SI2 Items of the Survey

SI2. People who are important to me think that I should use collaborative cloud computing tools for grading and feedback purposes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	26	20.2	20.2	20.2
	I mostly agree	22	17.1	17.1	37.2
	I somewhat agree	17	13.2	13.2	50.4
	I am neutral	42	32.6	32.6	82.9
	I somewhat disagree	7	5.4	5.4	88.4
	I mostly disagree	7	5.4	5.4	93.8
	I completely disagree	8	6.2	6.2	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

Table 48 shows the participants' responses on the following statement: "*In general, this school has supported the use of collaborative cloud computing tools for grading and feedback purposes."* A majority of the participants agreed to this statement.

Table 48

Responses to the SI3 Items of the Survey

SI3. In general, this school has supported the use of collaborative cloud computing tools for grading and feedback purposes.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	52	40.3	40.6	40.6
	I mostly agree	26	20.2	20.3	60.9
	I somewhat agree	19	14.7	14.8	75.8
	I am neutral	14	10.9	10.9	86.7
	I somewhat disagree	7	5.4	5.5	92.2
	I mostly disagree	5	3.9	3.9	96.1
	I completely disagree	5	3.9	3.9	100.0
	Total	128	99.2	100.0	
Missing	System	1	0.8		
Total		129	100.0		

Note. Survey items from UTAUT questionnaire

A simple linear regression with the moderators of age, gender, experience, and VU was performed. The standard coefficient for age is ß = 0.123, p = 0.103, indicating that age is not a significant moderator for BI with SI. For gender, the standard coefficient is ß = 0.158, $p < .05$, indicating that gender is a significant moderator for BI with SI. The standard coefficient for experience is ß = 0.129, p = 0.090, indicating that experience is not a significant moderator for BI with SI. For VU, the standard coefficient is ß = 0.133, p = 0.083, indicating that voluntariness is not a significant moderator for BI with SI. Venkatesh et al (2003) hypothesized that SI is a predictor for BI when moderated by age. The findings of this study concerning SI and BI when moderated by age, experience, and VU, do not support the UTAUT model when applied to the contexts of K-12 teachers in the United States. However, Venkatesh et al. hypothesized that SI is a predictor for BI when moderated by gender. The findings for this study support this hypothesis.

Facilitating Conditions

Venkatesh et al. (2003) did not hypothesize the role of FC with BI. Instead, the UTAUT developers hypothesized that FC is strongly correlated with UB or actual use of technology. In this study, I hypothesized that FC is strongly correlated with BI. Study findings in this study indicated that FC is significantly correlated with BI with the Pearson correlation of $r = 0.570$ and a Spearman correlation of $r^2 = 0.613$.

For the first item under facilitating conditions, *“I have the resources necessary to use collaborative cloud computing tools for grading and feedback purposes,”* 78% completely agreed, mostly agreed, and somewhat agreed to the statement while 9% stayed neutral. For the second item under facilitating conditions, *“I have the knowledge necessary to use collaborative cloud computing tools for grading and feedback purpose,”* 78% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 7% remained neutral. For the third item under facilitating conditions which was negatively worded and was re-coded, *“Collaborative cloud computing tools for grading and feedback purposes is not compatible to my operating system,”* 67% of the participants completely disagreed, mostly disagreed, and somewhat disagreed to the statement, indicating that majority of the participants’ operating systems are compatible with collaborative cloud computing tools for grading and feedback purposes. One participant skipped this item while 12% stayed neutral.

For the fourth item under facilitating conditions, *"If I have some difficulties with the use of collaborative cloud computing tools for grading and feedback purposes, a specific person or group is available for assistance,"* and 78% of the participants completely agreed, mostly agreed, and somewhat agreed to the statement while 12% remained neutral.

Tables 49-52 represent the participants' responses to the social influence items of the survey. The responses for the first item under facilitating conditions is shown in Table 49

Table 49

Responses to the FC1 Items of the Survey

FC1. I have the resources necessary to use collaborative cloud computing tools for grading and feedback purposes.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	55	42.6	42.6	42.6
	I mostly agree	23	17.8	17.8	60.5
	I somewhat agree	22	17.1	17.1	77.5
	I am neutral	11	8.5	8.5	86.0
	I somewhat disagree	8	6.2	6.2	92.2
	I mostly disagree	7	5.4	5.4	97.7
	I completely disagree	3	2.3	2.3	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

Responses for the second item under facilitating conditions are shown in Table 50.

Table 50

Responses to the FC2 Items of the Survey

FC2. I have the knowledge necessary to use collaborative cloud computing tools for grading and feedback purposes.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	47	36.4	36.4	36.4
	I mostly agree	28	21.7	21.7	58.1
	I somewhat agree	26	20.2	20.2	78.3
	I am neutral	9	7.0	7.0	85.3
	I somewhat disagree	8	6.2	6.2	91.5
	I mostly disagree	4	3.1	3.1	94.6
	I completely disagree	7	5.4	5.4	100.0
	Total	129	100.0	100.0	

Note. Survey items from UTAUT questionnaire

Responses for the third item under facilitating conditions are shown in Table 51.

Table 51

Responses to the FC3 Items of the Survey

FC3. Using collaborative cloud computing tools for grading and feedback purposes is not compatible to my operating system. (Example: Windows, iOS, Chrome)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	14	10.9	10.9	10.9
	I mostly agree	3	2.3	2.3	13.3
	I somewhat agree	10	7.8	7.8	21.1
	I am neutral	15	11.6	11.7	32.8
	I somewhat disagree	10	7.8	7.8	40.6
	I mostly disagree	18	14.0	14.1	54.7
	I completely disagree	58	45.0	45.3	100.0
	Total	128	99.2	100.0	
Missing	System	1	0.8		
Total		129	100.0		

Note. Survey items from UTAUT questionnaire

Finally, responses for the fourth item under facilitating conditions are shown in Table 52.

Table 52

Responses to the FC4 Items of the Survey

FC4. If I have some difficulties with the use of collaborative cloud computing tools for grading and feedback purposes, a specific person (or group) is available for assistance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	I completely agree	28	21.7	22.2	22.2
	I mostly agree	20	15.5	15.9	38.1
	I somewhat agree	30	23.3	23.8	61.9
	I am neutral	15	11.6	11.9	73.8
	I somewhat disagree	9	7.0	7.1	81.0
	I mostly disagree	9	7.0	7.1	88.1
	I completely disagree	15	11.6	11.9	100.0
	Total	126	97.7	100.0	
Missing	System	3	2.3		
Total		129	100.0		

Note. Survey items from UTAUT questionnaire

A linear regression with the added moderators of age, gender, experience, and VU was performed. For age, the standard coefficient is *ß* = -0.047, p = 0.583, indicating that age is not a significant moderator of BI with FC. For gender, the standard coefficient is *ß* = - 0.056, p = 0.504, indicating that gender is not a significant moderator for BI with FC. For experience, the standard coefficient is *ß* = -0.035, p = 0.682, indicating that experience is not a significant moderator for BI with FC. Finally, for VU, the standard coefficient is *ß* = - 0.044, p = 0.600, indicating that VU is not a significant moderator for BI with FC.

Availability of Collaborative Cloud Computing Tools for Teachers

Before interpreting the results of this study, I asked the school districts if they were willing to answer two supplemental questions: a) When did they provide their teachers and students with collaborative cloud computing tools? and b) Do they have a Bring Your Own Device (BYOD) program? Answers to these questions provided additional information about the experiences that both teachers and students have with these collaboration tools. One school district administrator indicated that GSuite, which includes commonly-used productivity and collaboration applications such as Google Docs (for word processing) and Google Drive (cloud drive), were made available to students, teachers, and staff in 2010. However, most of the school districts provided these applications through 1:1 Chromebooks in 2012. Therefore, long -term teachers would have had at least 5 years of experience with Google Drive. This finding is consistent with the number of years of experience with collaborative cloud computing tools that most teachers indicated in the survey. This finding also confirms the compatibility of the collaborative cloud computing tools with the teachers' and students' devices.

Interpretations

The positive correlations between PE, EE, SI, and FC and BI indicate that the UTAUT constructs are important factors to consider when examining K-12 teachers' intent to use new technologies. In this study, both Pearson and Spearman's correlations indicated strong positive relationships between the participating teachers' PE, EE, SI, and

FC and their BI to use collaborative cloud computing tools for grading and feedback purposes.

Strong relationships between PE, EE, and SI and BI to use specific technologies are consistent with the UTAUT model and other studies in educational contexts including Macharia's (2011), McCombs' (2011), and Williams' (2015) studies. In Macharia's study, PE, EE, SI, and FC of university managers and sponsors are significantly correlated with their BI to use e-learning tools. Correlations also exist between PE, EE, SI, and FC, and higher education instructors' BI to use educational technology tools in Williams' study. Finally, in McCombs' study, high school teachers' PE, EE, SI, and FC are correlated with their BI to adopt curriculum activities that require the use of technology.

The strong relationships that exist between PE, EE, SI, and FC and BI are consistent with other studies in the educational contexts including Anderson et al.'s (2006), Awwad and Al-Majali's (2015), Birch's (2003), Birch and Irvine's (2009), and Melocchi's (2014) studies. In Birch's study, PE, EE, SI, and FC of preservice teachers are correlated with their BI to use ICT. In Birch and Irvine's study, PE, EE, SI, and FC of preservice teachers are correlated with their BI to use ICT. Both Birch's and Birch and Irvine's studies indicated that EE has the highest correlation with BI to use ICT among preservice teachers.

Melocchi's (2014) study and Anderson et al.'s (2006) study indicated that the PE, EE, SI, and FC of higher education professors are correlated with their BI to integrate technology into their classrooms. Specifically, these technologies are iPads in Melocchi's study and PC tablets in Anderson et al.'s study. Finally, in Awwad and Al-Majali's (2015) study, PE, EE, SI, and FC are correlated with university students' BI to use online library services.

When Venkatesh et al. (2003) developed the UTAUT instrument to determine behavioral intent and use behavior of IS managers, Partial Least Squares (PLS) analysis resulted to high factor loadings for PE, EE, SI, and BI, explaining 70% of the variance. In 2012, Venkatesh, Thong, and Xu developed the UTAUT2 model to determine behavioral intent and use behavior of consumers. The PLS results indicated no difference between UTAUT and UTAUT2.

In this study, PCA results indicated that the items regarding K-12 teachers' BI, PE, and EE loaded strongly which explains 73.5% of the total variance followed by SI which explains 10% of the variance. The results of this study suggest that PE is the strongest indicator of BI to use collaborative cloud computing for grading and feedback purposes, followed by EE among K-12 teachers. This finding suggests that although FC is an important factor to consider when introducing new technologies to K-12 teachers, administrators and educational technologists should first focus on understanding teachers' BI which requires understanding their perceptions on the benefits and ease of use of certain technologies. Therefore, administrators should first get to know their teachers' PE and EE and BI to use certain technologies. Next, based on the age and gender of the teachers, SI should also be examined with emphasis on helping female teachers who are older than 40 years old. The UTAUT questionnaire can help administrators and educational technologists measure these perceptions. When PE, EE, SI, and BI are examined with the UTAUT moderators, there could be potential changes on the types of FC that should be used when training and supporting teachers to use certain technologies.

The UTAUT moderators of age, gender, experience, and VU are significant moderators when examining the relationships between BI to use collaborative cloud computing tools and PE and EE among K-12 teachers. The teachers' BI to use collaborative cloud computing tools for grading and feedback purposes is higher for male teachers than for female teachers, even when the predominant gender for the sample is female. Moreover, behavioral intent to use collaborative cloud computing is highest in teachers who are 26-30 years old, the youngest age group in this study. Teachers in the 41-50-year-old age group have the lowest behavioral intent. However, teachers who are in the 51+ year old age group have higher behavioral intent than teachers who are in the 41-50-year-old age group.

Venkatesh et al. (2003) hypothesized that as age increases, behavioral intent to use technology decreases. For this study, this hypothesis is applicable to K-12 teachers in the age range of 26 to 40. However, Venkatesh et al.'s (2003) UTAUT model posited that younger male individuals are more likely to adopt new technologies than their older male and female counterparts. The results of this study suggest that when introducing new technologies to teachers, school district administrators and educational technologists in the Pacific Coast region of the United States should recognize that female teachers who are older than 40 years old and over 50-year-old age groups generally make up majority of the teaching population and that age moderates their behavioral intent to use collaborative cloud computing tools. This information should be taken in consideration when developing professional development programs that include technology use.

Therefore, a study that combines Venkatesh et al.'s (2003) UTAUT model with Rogers' (2003) DOI models is a worthwhile study to undertake towards understanding technology integration among K-12 teachers. Rogers' (2003) DOI is a technology acceptance model wherein technology adopters are categorized into five types: a) innovators, b) early adopters, c) early majority adopters, d) late majority adopters, and e) laggards. Careful examination and recommendations on how to help older, female, K-12 teachers who belong in late majority adopter and laggard categories is necessary.

UTAUT developers posited that younger individuals perceive the use of technology as beneficial and easy to use. Regression results indicated that the correlation coefficient for PE and BI and for EE and BI are highest in teachers who are in the age group of 26-30 year old followed by the next age group of 31-40, indicating that younger teachers perceive collaborative cloud computing applications as easy to use, useful in their teaching profession, helpful in performing their teaching tasks quickly, thereby, increasing their productivity. Participants who are in the 41-50-year-old age group had the lowest correlation coefficient for PE and BI and EE and BI. The behavioral intent of the teachers in 41-50-year-old age group with PE and EE is lower than the behavioral intent of teachers who are in the 51+ year old age group. It is challenging to determine why participants who are older than 51 years old in this sample study had higher behavioral intent than those who are in the 41-50-year-old age group. Previous studies including Egbert et al.'s (2002) and Meskil et al.'s (2002) studies wherein experienced teachers or expert teachers were more comfortable using ICT than teachers who were new to the profession or novice teachers. Therefore, I can only speculate that the number of years of teaching experience is a driving factor behind these findings.

Gender is the only UTAUT moderator that played a significant role when examining the relationships between BI to use collaborative cloud computing and SI. In this study, male teachers have higher PE and EE than female teachers which supports the UTAUT model. Venkatesh, Thong, and Xu (2012) posited that "males are more independent and competitive who base their decisions on selective information, but females are more interdependent and cooperative who consider more details" (p. 163). The model also posited that males have higher BI to use new technologies than females based on previous studies including Russel and Bradley's (1997) and Todman (2000) which reported that female teachers have higher anxiety levels than male teachers when integrating technology into their classrooms. Having worked with K-12 teachers and being a teacher myself, I have seen first-hand, how the relationship between SI and BI can be moderated by gender; how female teachers (majority of the sample population) need social validation or affirmation from influential people about their decisions to integrate certain technologies or in this case collaborative cloud computing tools.

Therefore, a study that combines Venkatesh et al.'s (2003) UTAUT and Rogers' (2003) DOI models to investigate how school administrators and educational technologists can incorporate the significance of gender and SI with teachers who are considered innovators and early adopters would be beneficial.

Experience is a significant moderator between PE, EE, and BI. Survey responses indicated that teachers have the knowledge, support, and resources they need when using collaborative cloud computing. The same knowledge, support, and resources are needed when introducing the use of collaborative cloud computing for grading and feedback. Therefore, school district administrators and educational technologists should gradually introduce and train teachers to use collaborative cloud computing for grading and feedback purposes. Teacher training sessions that introduce new technologies should come in different stages wherein each stage reinforces teachers' previous experience with similar technologies. For example, teacher training sessions on the use of collaborative cloud computing can be done in three stages. During the first stage, teachers learn to use collaborative cloud computing tools with embedded rubrics for grading. During the second stage teachers learn to use collaborative cloud computing tools to add meaningful comments and annotations for feedback purposes. During the third stage, teachers learn to use collaborative cloud computing tools to combine the use of rubrics, comments, and annotations for grading and feedback purposes.

Age, gender, experience, and VU are not significant moderators of the teachers' FC and BI to use collaborative cloud computing tools for grading and feedback purposes.

These results are consistent with the UTAUT model wherein FC was not a direct determinant of BI to use technology but a direct determinant of UB. Therefore, a study on the use of collaborative cloud computing for grading and feedback purposes among K-12 teachers that uses Venkatesh et al.'s UTAUT model which includes BI and UB as dependent variables is also necessary.

In this study, the relationship between BI decreases as FC increases when age, gender, experience, and voluntariness of use were applied. My interpretations of these findings are based on my experience. For age, I look at the type of facilitating conditions that are available to teachers. Most schools provide professional development programs with hands-on training for their teachers on the use of certain technologies. These programs are usually held for one or two days. After training, teachers have access to tutorials or job aids including interactive materials. Teachers also are welcome to call the technology department as needed. In my experience, most older teachers refrain from calling the technology department. I also noticed that older teachers do not use the job aids and other training materials provided for them compared to younger teachers. I attribute this observation to Venkatesh et al.'s (2002) study which were based on Morris et al. (2005) and Plude and Hoyer (1985) studies, indicating that it is more difficult for older individuals to process complex information which contributes to their difficulties in learning new technologies. Based on my experience, offering older teachers one-on-one, hands-on training is beneficial, however, not many teachers request this type of support or are aware that this type of support is available to them.

Behavioral intent decreases as FC increases when moderated by gender. For this finding, I refer to studies including Henning and Jardim (1977), Rotter and Portugal (1969), and Venkatesh and Morris' (2000), which posited that males are more willing to achieve their goals by overcoming barriers or constraints than females who tend to focus on the amount of effort or magniture of effort it takes to achieve their goals. Behavioral intent also decreases as FC increases when moderated by experience. This finding is related to Venkatesh et al.'s (2003) UTAUT model which posits that as experience increases, confidence in using technology increases. Therefore, the need for additional resources such as training also decrease. Finally, the relationship between BI also decreases when FC increases when moderated by voluntariness of use. The issue of voluntariness of use (VU) can significantly influence teachers' intent to use collaborative cloud computing tools for grading and feedback purposes and performance expectancy and effort expectancy. Study findings suggest that school districts can successfully help teachers integrate the use of collaborative cloud computing for grading and feedback purposes if using them is not mandated. However, study results indicated that teachers from the same school districts have conflicting perceptions on the use of collaborative cloud computing tools for grading and feedback purposes at their school sites. To understand these conflicting perceptions, I reflected on the teachers' professional development programs which include technology use training sessions. Teachers' attendance to professional development programs are usually mandatory but the use of most of the technologies introduced in these training sessions are voluntary. These two events can be confusing for teachers who may have misinterpreted the districts' technology use policies.

Therefore, school districts should take into consideration these perceptions. It is unclear if school administrators for each site have accurately communicated or suggested their expectations or the mandatory use or voluntariness of use of collaborative cloud computing tools for grading and feedback purposes. To avoid any potential misinterpretation on the voluntariness of use or mandatory use of specific technologies for instruction, school administrators should clearly convey district-wide objectives and expectations on technology.

Scope and Delimitations

One of the limitations of this study is the use of only one instrument to measure the perceptions of the teachers on the use of collaborative cloud computing tools for grading and feedback purposes. One instrument on BI is not sufficient to identify and measure the multi-faceted perceptions of K-12 teachers when it comes to technology integration.

Although the predominant gender and age of K-12 teachers in the Pacific Coast region of the United States consists of female teachers who are older than 31 years-old, the number of years of experience in teaching in addition to the number of years in using collaborative cloud computing could be helpful when evaluating teachers' performance expectancy and effort expectancy and behavioral intent to use collaborative cloud computing for grading and feedback purposes. This study did not investigate if and to what extent, subjects and grade levels taught influence teachers' intent to use collaborative cloud computing tools for grading and feedback purposes. For instance, it would be unfair to compare the use of collaborative cloud computing tools for grading and feedback purposes between Kindergarten and secondary teachers.

Another concern for this study is the number of teachers who stayed neutral when answering questions pertaining to the use of collaborative cloud computing tools for grading and feedback purposes. I am unsure if teachers stayed neutral because they are unsure as how to answer certain items or if they lack the confidence that their identity remained anonymous.

Recommendations

Future studies on the use of UTAUT model in K-12 classrooms should include having a larger sample size to disaggregate and interpret the items in the survey. A study that includes other regions might provide a deeper understanding of the teachers' intent to use collaborative cloud computing for grading and feedback purposes. Having a larger sample size can also mean equal distribution of the teachers' age and gender and a more comprehensive study on understanding the teachers' intent to use collaborative cloud computing tools for grading and feedback purposes.

The number of years of teaching experience is important to know in future studies. Based on my experience as a teacher and as an instructional technologist, new teachers tend to focus more on their teaching abilities which encompass classroom and student behavior management whereas more experienced teachers tend to focus on other skills including their technology skills. Future studies that document the teachers' years of teaching experience, and the grade levels and subjects that they teach would be beneficial in understanding how age, gender, and experience with similar tools can influence teachers' intent to use collaborative cloud computing for grading and feedback purposes. These studies should also include use behavior as a dependent variable.

A longitudinal version of this study with use behavior could also benefit understanding if the teachers' intent to use collaborative cloud computing tools for grading and feedback purposes can be attributed to their actual use. Finally, a qualitative study to document the concerns of the teachers when using collaborative cloud computing would also contribute to a more comprehensive picture of the teachers' intent to use collaborative cloud computing tools for grading and feedback purposes.

Social Change and Implications for the U.S. K-12 Teaching Population

Establishing that Venkatesh et al.'s (2003) UTAUT model is adaptable and useful to the U.S. K-12 teaching population is a significant social change to which this study contributes. The study findings in which a deeper understanding of how K-12 teachers interact with collaborative cloud computing tools for grading and feedback purposes with their understanding of the tools' benefits, ease of use, the influence of other people on their use of these tools, and the support and resources that K-12 teachers acquire from their school districts have the potential to make significant impact on K-12 teachers' professional development programs wherein new technologies are introduced.

Understanding the strong predictors of intent to use which can influence teachers' technology integration is key information that I acquired from this study. This study helps administrators and educational technologists understand how teachers view collaborative cloud computing for grading and feedback purposes. First, study results indicated that most teachers perceive collaborative cloud computing for grading and feedback purposes as a positive contributor to their teaching performance. Second, most teachers perceive these tools as easy to use. Third, the people who influence the teachers agreed that teachers should use collaborative cloud computing tools for grading and feedback purposes.

Fourth, this study has established that most teachers have the resources, skills, and the support they need to use these tools. Although this study does not capture the perceptions of the entire teaching population, it gives administrators and educational technologists new opportunities to examine not just the availability of collaborative cloud computing tools for their districts but also the assurance that training, support, and other resources that teachers need to use these tools for grading and feedback purposes are available. Finally, this study encourages administrators and educational technologists to thoroughly identify and address their teachers' technical skills, interests, and expectations before introducing them with new technologies or programs.

As with the moderators of the UTAUT model, careful consideration to the teachers' age and gender when introducing new technologies should be taken. Venkatesh et al. (2003) posited that age and gender influence technology use wherein older female individuals may be unsure of new technologies introduced to them. Comprehensive evaluations and investigations on how to encourage female teachers who are older than

30-years old (the predominant demographic among K-12 teachers in the Pacific Coast region) should be prioritized.

Experience using similar technologies influences the teachers' use of new technologies. A school district could investigate the extent of knowledge and experience teachers have with collaborative cloud computing tools before encouraging or training them to use these tools for grading and feedback purposes. Also, most school districts do not mandate the use of new technologies for grading and feedback purposes which is generally what teachers prefer. However, since different teachers from the same school districts provided conflicting opinions as to the mandatory or voluntariness of use of these tools, how administrators and educational technologists communicate with the teachers and the emphasis on what is expected from them should be clarified. If the use of collaborative cloud computing tools for grading and feedback purposes is voluntary, the emphasis on the non-mandatory use of these tools should be articulated to the teachers. This is an important aspect of intent to use new technologies for end users in that if they perceive the use as voluntary, they are more likely to use these tools on their own. Finally, administrators and educational technologists can use the UTAUT model in their district-wide strategic plan when introducing new technologies to their teachers.

Conclusion

Study findings indicated that K-12 administrators can help their teachers integrate technology by using a model that has proven to have high reliability and validity in other professions. The microcosm of K-12 teacher population may be different from the microcosm of professionals in business, healthcare, information systems, and banking, but surprisingly, they also have significant similarities: Teachers' perceptions are similar to the perceptions of professionals in other industries. When it comes to adopting new technologies, it is important that technology must be beneficial (performance expectancy) and that technology must be easy to use (effort expectancy).

Performance expectancy, effort expectancy, social influence, and facilitating conditions are positively correlated with the intent to use collaborative cloud computing tools for grading and feedback purposes among K-12 teachers in the Pacific Coast region of the United States. Collaborative cloud computing tools are available to nationwide K-12 teachers but their use for grading and feedback purposes have yet to be established. Therefore, this study established that most K-12 teachers in the Pacific Coast region of the United States have the knowledge, skills, and resources they need to use these tools other than for filing and storage purposes.

Although K-12 teachers' performance expectancy and effort expectancy are strong predictors of behavioral intent to use collaborative cloud computing for grading and feedback purposes when controlled by age and gender, it has been established that age, gender, experience, and voluntariness of use are not significant moderators of K-12 teachers' facilitating conditions and behavioral intent to use collaborative cloud computing for grading and feedback purposes. However, social influence is a strong predictor of behavioral intent to use collaborative cloud computing for grading and feedback purposes when moderated by gender indicating the importance of influencers in K-12 education. The opinions of other people are pivotal when introducing new technologies to teachers.

The use of UTAUT model is an important aspect of this study. The model works well with K-12 teachers. It captures the teachers' perceptions on technology integration and behavioral intent to use technology. Overall, this study has the potential to help K-12 administrators and educational technologists in the introduction, training, and continuous support for teachers to use of collaborative cloud computing for grading and feedback purposes.

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Appendix A: Permission to Use the UTAUT Model and Instrument

Papers Permissions/Download
1 message

WordPress [redacted] Wed, Dec 7, 2016 at 4:58 PM
To: Dorothy Kropf [redacted]

Thank you for your interest. Your permission to use content from the paper is granted. Please cite the work appropriately. Note that this permission does not exempt you from seeking the necessary permission from the copyright owner (typically, the publisher of the journal) for any reproduction of any materials contained in this paper.

Sincerely,
Viswanath Venkatesh
Distinguished Professor and George and Boyce Billingsley Chair in Information Systems
Email: [redacted]
Websit[redacted]

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

Table 16. Items Used in Estimating UTAUT

Performance expectancy	
U6:	I would find the system useful in my job.
RA1:	Using the system enables me to accomplish tasks more quickly.
RA5:	Using the system increases my productivity.
OE7:	If I use the system, I will increase my chances of getting a raise.
Effort expectancy	
EOU3:	My interaction with the system would be clear and understandable.
EOU5:	It would be easy for me to become skillful at using the system.
EOU6:	I would find the system easy to use.
EU4:	Learning to operate the system is easy for me.
Attitude toward using technology	
A1:	Using the system is a bad/good idea.
AF1:	The system makes work more interesting.
AF2:	Working with the system is fun.
Affect1:	I like working with the system.
Social influence	
SN1:	People who influence my behavior think that I should use the system.
SN2:	People who are important to me think that I should use the system.
SF2:	The senior management of this business has been helpful in the use of the system.
SF4:	In general, the organization has supported the use of the system.
Facilitating conditions	
PBC2:	I have the resources necessary to use the system.
PBC3:	I have the knowledge necessary to use the system.
PBC5:	The system is not compatible with other systems I use.
FC3:	A specific person (or group) is available for assistance with system difficulties.
Self-efficacy	
I could complete a job or task using the system…	
SE1:	If there was no one around to tell me what to do as I go.
SE4:	If I could call someone for help if I got stuck.
SE6:	If I had a lot of time to complete the job for which the software was provided.
SE7:	If I had just the built-in help facility for assistance.
Anxiety	
ANX1:	I feel apprehensive about using the system.
ANX2:	It scares me to think that I could lose a lot of information using the system by hitting the wrong key.
ANX3:	I hesitate to use the system for fear of making mistakes I cannot correct.
ANX4:	The system is somewhat intimidating to me.
Behavioral intention to use the system	
BI1:	I intend to use the system in the next <n> months.
BI2:	I predict I would use the system in the next <n> months.
BI3:	I plan to use the system in the next <n> months.

Appendix C: Email Invitation (IRB-Approved)

Dear Prospective Survey Participant,

My name is Dorothy Kropf and I am a doctoral student at Walden University Online. This is a letter of invitation to participate in my doctoral research study entitled *Applying UTAUT to Determine Intent to Use Cloud Computing in K-12 Classrooms*. The purpose of this study is to explore factors that can influence a person's intent to use and actual use of collaborative cloud computing applications for grading and feedback purposes. Examples of cloud computing applications are Google Drive, OneDrive, and Dropbox.

Participating in this study is strictly voluntary. There is no compensation for participating in this study, however, your participation has the potential to contribute to the growing literature on collaborative cloud computing in K-12 education. You are free to accept or turn down this invitation. There will be no negative consequences for participating in this study. Your identity will not be revealed and any identifiable information including IP addresses will not be captured. If you decide to be in the study, you can still change your mind. You may stop and exit the survey at any time.

An informed consent agreement will appear on the first screen page of the survey. The survey will take 15-30 minutes to complete. If you would like more information about this study, you can send a request for more information to XXX@XXXX. If you decide to participate after reading this email invitation, you access the survey from the following link:

https://www.surveymonkey.com/XX/XXXX

Sincerely,

Dorothy Kropf

Appendix D: Initial Phone Script (IRB Approved)

Hello, my name is Dorothy Kropf. I am a doctoral student at Walden University. *(Probably small talk here)*.

For my dissertation, I am conducting a research study about teachers' intent to use online collaborative applications. The results can be beneficial for your school district in predicting teachers' intent to use collaborative cloud applications for grading and feedback.

The study will be conducted from August to October of this year. I was wondering if you could help me get in touch with the right person or department?

Appendix E: Follow-Up Phone Script

Hello, my name is Dorothy Kropf. I spoke with you on _______ about conducting my dissertation study at your school district.

Small talk (greetings)

As I stated from our last phone conversation, this research study is about teachers' intent to use collaborative cloud applications and the can be beneficial for your school district in predicting teachers' intent to use collaborative cloud applications for grading and feedback.

The study will be conducted from August to October of this year. I was wondering if you could help me get in touch with the right person or department?

Appendix F: Consent Form

Consent Form

You are invited to take part in a research study about the use of collaborative cloud computing for grading and feedback purposes among K-12 teachers. The researcher is inviting all K-12 teachers who are currently working at the *(name of school district)* to be part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Dorothy Kropf who is a doctoral student at Walden University.

Background Information:

The purpose of this study is to explore factors that can influence a person's intent to use and actual use of collaborative cloud computing applications for grading and feedback purposes. Examples of cloud computing applications are Google Drive, OneDrive, and Dropbox.

The survey takes approximately 15-30 minutes to complete. All of the questions in the survey are multiple choice with required answer choices ranging from "completely agree" to "completely disagree." Sample survey items are:

- I find that using cloud drives to grade students' works and to give them feedback can help me do my job well.
- I find that using cloud drives to grade students' works and to give them feedback can help me achieve things that are important to me.

Voluntary Nature of the Study:

This study is voluntary. You are free to accept or turn down the invitation. No one will treat you differently if you decide not to be in the study. If you decide to be in the study now, you can still change your mind later. You may stop at any time.

Compensation:

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

Risks and Benefits of Being in the Study:

Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such fatigue, stress or becoming frustrated. Being in this study would not pose risk to your safety or wellbeing.

This study can impact instructional delivery and services in K-12 classrooms. The potential significance of this study may affect teachers' professional development programs and faculty training sessions where the use of new technologies will be introduced.

Privacy:

Reports coming out of this study will not share the identities of individual participants. Details that might identify participants, such as IP addresses will not be captured. Even the researcher will not know who you are. The researcher will not use any personal information such as demographics or any of your responses for any purpose outside of this research project. Data will be kept secure by the researcher in a secure, password protected cloud drive. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:

You may ask any questions you have now or if you have questions later, you may contact the researcher via email at [redacted] If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at my university at [redacted] Walden University's approval number for this study is 09-25-17-0362938 and it expires on September 24th, 2018.

Obtaining Your Consent

To protect your privacy, no consent signature is requested. If you feel you understand the study well enough to make a decision about it, please indicate your consent by clicking on the **"Go to Survey"** link below. You may print or save this consent form for your records.

2017.09.2
5 13:25:13
-05'00'

Appendix G: Survey Template through Survey Monkey

The purpose of this study is to explore factors that can influence a person's intent to use and actual use of collaborative cloud computing applications for grading and feedback purposes. Examples of cloud computing applications are Google Drive, OneDrive, and Dropbox.

All of the questions in the survey are multiple choice with required answer choices ranging from "completely agree" to "completely disagree." Sample survey items are:

I find that using cloud drives to grade students' works and to give them feedback can help me do my job well.
I find that using cloud drives to grade students' works and to give them feedback can help me achieve things that are important to me.
Voluntary Nature of the Study:

This study is voluntary. You are free to accept or turn down the invitation. No one will treat you differently if you decide not to be in the study. If you decide to be in the study now, you can still change your mind later. You may stop at any time.

Compensation:

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

Risks and Benefits of Being in the Study:

Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such fatigue, stress or becoming frustrated. Being in this study would not pose risk to your safety or wellbeing.

This study can impact instructional delivery and services in K-12 classrooms. The potential significance of this study may affect teachers' professional development programs and faculty training sessions where the use of new technologies will be introduced.

Privacy:

Reports coming out of this study will not share the identities of individual participants. Details that might identify participants, such as IP addresses will not be captured. Even the researcher will not know who you are. The researcher will not use any personal information such as demographics or any of your responses for any purpose outside of this research project. Data will be kept secure by the researcher in a secure, password protected cloud drive. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:

You may ask any questions you have now or if you have questions later, you may contact the researcher via email at dorothy.kropf@waldenu.edu. If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at my university at 612-312-1210. Walden University's approval number for this study is 09-25-17-0362938and it expires on 9/24/2018.

Obtaining Your Consent

To protect your privacy, no consent signature is requested. If you feel you understand the study well enough to make a decision about it, please indicate your consent by clicking on the "Go to Survey" link below. You may print or save this consent form for your records.

Go to Survey

Exit

Research Study for K-12 Teachers

This survey is from an outside researcher who is not affiliated with __________. Your participation is voluntary. Your responses are confidential. This survey is about your teaching role and the use of collaborative cloud computing tools for grading and feedback purposes. Examples of collaborative cloud computing tools are GoogeDrive, OneDrive, and Dropbox.

Gender

○ Male ○ Female

Age Group

○ 21-25 ○ 26-30 ○ 31-40 ○ 41-50 ○ 51+

Experience: How many years have you been using collaborative cloud computing tools such as Google Drive, OneDrive, and Dropbox or similar technologies?

Less than 1 year	1-3 years	4-6 years	7-9 years	10-12 years	13-15 years
○	○	○	○	○	○

Describe the use of collaborative cloud computing tools such as Google Drive, OneDrive, and Dropbox in your school.

	Completely mandatory	Mostly mandatory	Somewhat mandatory	Neutral	Somewhat voluntary	Mostly voluntary	Completely voluntary
VU1: My use of collaborative cloud computing tools for grading and feedback purposes is voluntary.	○	○	○	○	○	○	○

	I completely agree	I mostly agree	I somewhat agree	I am neutral	I somewhat disagree	I mostly disagree	I completely disagree
PE1. I find collaborative cloud computing tools for grading and feedback purposes useful in my job.	○	○	○	○	○	○	○
PE2. Using collaborative cloud computing tools for grading and feedback purposes enables me to accomplish my tasks more quickly.	○	○	○	○	○	○	○
PE3. Using collaborative cloud computing tools for grading and feedback purposes increases my productivity.	○	○	○	○	○	○	○

PE2. Using collaborative cloud computing tools for grading and feedback purposes enables me to accomplish my tasks more quickly.	○	○	○	○	○	○	○
PE3. Using collaborative cloud computing tools for grading and feedback purposes increases my productivity.	○	○	○	○	○	○	○
EE1. It would be easy for me to become skillful at using collaborative cloud computing tools for grading and feedback purposes	○	○	○	○	○	○	○
EE2. I would find collaborative cloud computing tools for grading and feedback purposes easy to use.	○	○	○	○	○	○	○
EE3. Learning to operate collaborative cloud computing tools for grading and feedback purposes is easy for me.	○	○	○	○	○	○	○
SI1. People who influence my behavior think that I should use collaborative cloud computing tools for grading and feedback purposes.	○	○	○	○	○	○	○

SI2. People who are important to me think that I should use collaborative cloud computing tools for grading and feedback purposes.	○	○	○	○	○	○	○
SI3. In general, this school has supported the use of collaborative cloud computing tools for grading and feedback purposes.	○	○	○	○	○	○	○
FC1. I have the resources necessary to use collaborative cloud computing tools for grading and feedback purposes.	○	○	○	○	○	○	○
FC2. I have the knowledge necessary to use collaborative cloud computing tools for grading and feedback purposes.	○	○	○	○	○	○	○
FC3. Using collaborative cloud computing tools for grading and feedback purposes is not compatible to my operating system. (Example: Windows, iOS, Chrome)	○	○	○	○	○	○	○
FC4. If I have some difficulties with the use of collaborative cloud computing tools for grading and feedback purposes, a specific person (or group) is available for assistance.	○	○	○	○	○	○	○
BI1: I intend to use collaborative cloud computing tools for grading and feedback purposes in the near future.	○	○	○	○	○	○	○

BI2: I predict I would use collaborative cloud computing tools for grading and feedback purposes in the near future.	○	○	○	○	○	○	○
BI3: I plan to use collaborative cloud computing tools for grading and feedback purposes in the near future.	○	○	○	○	○	○	○

Appendix H: SPSS Codebook

id

		Value	Count	Percent
Standard Attributes	Position	**1**		
	Label	**<none>**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Nominal**		
	Role	**None**		
Valid Values	1.00		**1**	**0.8%**
	2.00		**1**	**0.8%**
	3.00		**1**	**0.8%**
	4.00		**1**	**0.8%**
	5.00		**1**	**0.8%**
	6.00		**1**	**0.8%**
	7.00		**1**	**0.8%**
	8.00		**1**	**0.8%**
	9.00		**1**	**0.8%**
	10.00		**1**	**0.8%**
	11.00		**1**	**0.8%**
	12.00		**1**	**0.8%**
	13.00		**1**	**0.8%**
	14.00		**1**	**0.8%**
	15.00		**1**	**0.8%**
	16.00		**1**	**0.8%**
	17.00		**1**	**0.8%**
	18.00		**1**	**0.8%**
	19.00		**1**	**0.8%**
	20.00		**1**	**0.8%**
	21.00		**1**	**0.8%**
	22.00		**1**	**0.8%**
	23.00		**1**	**0.8%**
	24.00		**1**	**0.8%**

25.00	**1**	**0.8%**
26.00	**1**	**0.8%**
27.00	**1**	**0.8%**
28.00	**1**	**0.8%**
29.00	**1**	**0.8%**
30.00	**1**	**0.8%**
31.00	**1**	**0.8%**
32.00	**1**	**0.8%**
33.00	**1**	**0.8%**
34.00	**1**	**0.8%**
35.00	**1**	**0.8%**
36.00	**1**	**0.8%**
37.00	**1**	**0.8%**
38.00	**1**	**0.8%**
39.00	**1**	**0.8%**
40.00	**1**	**0.8%**
41.00	**1**	**0.8%**
42.00	**1**	**0.8%**
43.00	**1**	**0.8%**
44.00	**1**	**0.8%**
45.00	**1**	**0.8%**
46.00	**1**	**0.8%**
47.00	**1**	**0.8%**
48.00	**1**	**0.8%**
49.00	**1**	**0.8%**
50.00	**1**	**0.8%**
51.00	**1**	**0.8%**
52.00	**1**	**0.8%**
53.00	**1**	**0.8%**
54.00	**1**	**0.8%**
55.00	**1**	**0.8%**
56.00	**1**	**0.8%**
57.00	**1**	**0.8%**
58.00	**1**	**0.8%**
59.00	**1**	**0.8%**
60.00	**1**	**0.8%**
61.00	**1**	**0.8%**

62.00	**1**	**0.8%**
63.00	**1**	**0.8%**
64.00	**1**	**0.8%**
65.00	**1**	**0.8%**
66.00	**1**	**0.8%**
67.00	**1**	**0.8%**
68.00	**1**	**0.8%**
69.00	**1**	**0.8%**
70.00	**1**	**0.8%**
71.00	**1**	**0.8%**
72.00	**1**	**0.8%**
73.00	**1**	**0.8%**
74.00	**1**	**0.8%**
75.00	**1**	**0.8%**
76.00	**1**	**0.8%**
77.00	**1**	**0.8%**
78.00	**1**	**0.8%**
79.00	**1**	**0.8%**
80.00	**1**	**0.8%**
81.00	**1**	**0.8%**
82.00	**1**	**0.8%**
83.00	**1**	**0.8%**
84.00	**1**	**0.8%**
85.00	**1**	**0.8%**
86.00	**1**	**0.8%**
87.00	**1**	**0.8%**
88.00	**1**	**0.8%**
89.00	**1**	**0.8%**
90.00	**1**	**0.8%**
91.00	**1**	**0.8%**
92.00	**1**	**0.8%**
93.00	**1**	**0.8%**
94.00	**1**	**0.8%**
95.00	**1**	**0.8%**
96.00	**1**	**0.8%**
97.00	**1**	**0.8%**
98.00	**1**	**0.8%**

99.00	**1**	**0.8%**
100.00	**1**	**0.8%**
101.00	**1**	**0.8%**
102.00	**1**	**0.8%**
103.00	**1**	**0.8%**
104.00	**1**	**0.8%**
105.00	**1**	**0.8%**
106.00	**1**	**0.8%**
107.00	**1**	**0.8%**
108.00	**1**	**0.8%**
109.00	**1**	**0.8%**
110.00	**1**	**0.8%**
111.00	**1**	**0.8%**
112.00	**1**	**0.8%**
113.00	**1**	**0.8%**
114.00	**1**	**0.8%**
115.00	**1**	**0.8%**
116.00	**1**	**0.8%**
117.00	**1**	**0.8%**
118.00	**1**	**0.8%**
119.00	**1**	**0.8%**
120.00	**1**	**0.8%**
121.00	**1**	**0.8%**
122.00	**1**	**0.8%**
123.00	**1**	**0.8%**
124.00	**1**	**0.8%**
125.00	**1**	**0.8%**
126.00	**1**	**0.8%**
127.00	**1**	**0.8%**
128.00	**1**	**0.8%**
129.00	**1**	**0.8%**

Q1_GENDER

		Value	Count	Percent
Standard Attributes	Position	**2**		
	Label	**gender**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Nominal**		
	Role	**None**		
Valid Values	1.00	**male**	**26**	**20.2%**
	2.00	**female**	**102**	**79.1%**
Missing Values	System		**1**	**0.8%**

Q2_AGE_GROUP

		Value	Count	Percent
Standard Attributes	Position	**3**		
	Label	**age_grp**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	11.00	**21-25**	**3**	**2.3%**
	12.00	**26-30**	**13**	**10.1%**
	13.00	**31-40**	**43**	**33.3%**
	14.00	**41-50**	**32**	**24.8%**
	15.00	**51+**	**37**	**28.7%**
Missing Values	System		**1**	**0.8%**

Q3_YEARS_OF_EXP_WITH_CCC

		Value	Count	Percent
Standard Attributes	Position	**4**		
	Label	**Exp**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	21.00	**<1**	**4**	**3.1%**
	22.00	**1-3**	**53**	**41.1%**
	23.00	**4-6**	**40**	**31.0%**
	24.00	**7-9**	**22**	**17.1%**
	25.00	**10-12**	**4**	**3.1%**
	26.00	**13-15**	**6**	**4.7%**

Q4_VOLUNTARINESS_OF_USE

		Value	Count	Percent
Standard Attributes	Position	**5**		
	Label	**Vu**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**Completely Mandatory**	**14**	**10.9%**
	2.00	**Mostly Mandatory**	**7**	**5.4%**
	3.00	**Somewhat Mandatory**	**26**	**20.2%**
	4.00	**Neutral**	**13**	**10.1%**
	5.00	**Somewhat Voluntary**	**8**	**6.2%**
	6.00	**Mostly Voluntary**	**23**	**17.8%**
	7.00	**Completely Voluntary**	**38**	**29.5%**

Q5_PE1

		Value	Count	Percent
Standard Attributes	Position	6		
	Label	pe1		
	Type	Numeric		
	Format	F8.2		
	Measurement	Ordinal		
	Role	None		
Valid Values	1.00	I completely agree	51	39.5%
	2.00	I mostly agree	36	27.9%
	3.00	I somewhat agree	11	8.5%
	4.00	I am neutral	19	14.7%
	5.00	I somewhat disagree	3	2.3%
	6.00	I mostly disagree	6	4.7%
	7.00	I completely disagree	3	2.3%

Q6_PE2

		Value	Count	Percent
Standard Attributes	Position	7		
	Label	pe2		
	Type	Numeric		
	Format	F8.2		
	Measurement	Ordinal		
	Role	None		
Valid Values	1.00	I completely agree	49	38.0%
	2.00	I mostly agree	26	20.2%
	3.00	I somewhat agree	22	17.1%
	4.00	I am neutral	17	13.2%
	5.00	I somewhat disagree	3	2.3%
	6.00	I mostly disagree	7	5.4%
	7.00	I completely disagree	5	3.9%

Q7_PE3

		Value	Count	Percent
Standard Attributes	Position	**8**		
	Label	**pe3**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**40**	**31.0%**
	2.00	**I mostly agree**	**30**	**23.3%**
	3.00	**I somewhat agree**	**19**	**14.7%**
	4.00	**I am neutral**	**20**	**15.5%**
	5.00	**I somewhat disagree**	**9**	**7.0%**
	6.00	**I mostly disagree**	**6**	**4.7%**
	7.00	**I completely disagree**	**5**	**3.9%**

Q8_EE1

		Value	Count	Percent
Standard Attributes	Position	**9**		
	Label	**ee1**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**62**	**48.1%**
	2.00	**I mostly agree**	**30**	**23.3%**
	3.00	**I somewhat agree**	**17**	**13.2%**
	4.00	**I am neutral**	**8**	**6.2%**
	5.00	**I somewhat disagree**	**3**	**2.3%**
	6.00	**I mostly disagree**	**6**	**4.7%**
	7.00	**I completely disagree**	**3**	**2.3%**

Q9_EE2

		Value	Count	Percent
Standard Attributes	Position	**10**		
	Label	**ee2**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**48**	**37.2%**
	2.00	**I mostly agree**	**43**	**33.3%**
	3.00	**I somewhat agree**	**14**	**10.9%**
	4.00	**I am neutral**	**12**	**9.3%**
	5.00	**I somewhat disagree**	**3**	**2.3%**
	6.00	**I mostly disagree**	**6**	**4.7%**
	7.00	**I completely disagree**	**3**	**2.3%**

Q10_EE3

		Value	Count	Percent
Standard Attributes	Position	**11**		
	Label	**ee3**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**50**	**38.8%**
	2.00	**I mostly agree**	**38**	**29.5%**
	3.00	**I somewhat agree**	**18**	**14.0%**
	4.00	**I am neutral**	**12**	**9.3%**
	5.00	**I somewhat disagree**	**4**	**3.1%**
	6.00	**I mostly disagree**	**3**	**2.3%**
	7.00	**I completely disagree**	**4**	**3.1%**

Q11_SI1

		Value	Count	Percent
Standard Attributes	Position	**12**		
	Label	**si1**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**25**	**19.4%**
	2.00	**I mostly agree**	**27**	**20.9%**
	3.00	**I somewhat agree**	**24**	**18.6%**
	4.00	**I am neutral**	**35**	**27.1%**
	5.00	**I somewhat disagree**	**7**	**5.4%**
	6.00	**I mostly disagree**	**5**	**3.9%**
	7.00	**I completely disagree**	**6**	**4.7%**

Q12_SI2

		Value	Count	Percent
Standard Attributes	Position	**13**		
	Label	**si2**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**26**	**20.2%**
	2.00	**I mostly agree**	**22**	**17.1%**
	3.00	**I somewhat agree**	**17**	**13.2%**
	4.00	**I am neutral**	**42**	**32.6%**
	5.00	**I somewhat disagree**	**7**	**5.4%**
	6.00	**I mostly disagree**	**7**	**5.4%**
	7.00	**I completely disagree**	**8**	**6.2%**

Q13_SI3

		Value	Count	Percent
Standard Attributes	Position	**14**		
	Label	**si3**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**52**	**40.3%**
	2.00	**I mostly agree**	**27**	**20.9%**
	3.00	**I somewhat agree**	**19**	**14.7%**
	4.00	**I am neutral**	**14**	**10.9%**
	5.00	**I somewhat disagree**	**7**	**5.4%**
	6.00	**I mostly disagree**	**5**	**3.9%**
	7.00	**I completely disagree**	**5**	**3.9%**

Q14_FC1

		Value	Count	Percent
Standard Attributes	Position	**15**		
	Label	**fc1**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**55**	**42.6%**
	2.00	**I mostly agree**	**23**	**17.8%**
	3.00	**I somewhat agree**	**22**	**17.1%**
	4.00	**I am neutral**	**11**	**8.5%**
	5.00	**I somewhat disagree**	**8**	**6.2%**
	6.00	**I mostly disagree**	**7**	**5.4%**
	7.00	**I completely disagree**	**3**	**2.3%**

Q15_FC2

		Value	Count	Percent
Standard Attributes	Position	**16**		
	Label	**fc2**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**47**	**36.4%**
	2.00	**I mostly agree**	**28**	**21.7%**
	3.00	**I somewhat agree**	**26**	**20.2%**
	4.00	**I am neutral**	**9**	**7.0%**
	5.00	**I somewhat disagree**	**8**	**6.2%**
	6.00	**I mostly disagree**	**4**	**3.1%**
	7.00	**I completely disagree**	**7**	**5.4%**

Q16_FC3

		Value	Count	Percent
Standard Attributes	Position	**17**		
	Label	**fc3**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**14**	**10.9%**
	2.00	**I mostly agree**	**4**	**3.1%**
	3.00	**I somewhat agree**	**10**	**7.8%**
	4.00	**I am neutral**	**15**	**11.6%**
	5.00	**I somewhat disagree**	**10**	**7.8%**
	6.00	**I mostly disagree**	**18**	**14.0%**
	7.00	**I completely disagree**	**58**	**45.0%**

Q17_FC4

		Value	Count	Percent
Standard Attributes	Position	**18**		
	Label	**fc4**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**28**	**21.7%**
	2.00	**I mostly agree**	**23**	**17.8%**
	3.00	**I somewhat agree**	**30**	**23.3%**
	4.00	**I am neutral**	**15**	**11.6%**
	5.00	**I somewhat disagree**	**9**	**7.0%**
	6.00	**I mostly disagree**	**9**	**7.0%**
	7.00	**I completely disagree**	**15**	**11.6%**

Q18_BI1

		Value	Count	Percent
Standard Attributes	Position	**19**		
	Label	**bi1**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**56**	**43.4%**
	2.00	**I mostly agree**	**22**	**17.1%**
	3.00	**I somewhat agree**	**14**	**10.9%**
	4.00	**I am neutral**	**23**	**17.8%**
	5.00	**I somewhat disagree**	**2**	**1.6%**
	6.00	**I mostly disagree**	**6**	**4.7%**
	7.00	**I completely disagree**	**6**	**4.7%**

Q19_BI2

		Value	Count	Percent
Standard Attributes	Position	**20**		
	Label	**bi2**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**59**	**45.7%**
	2.00	**I mostly agree**	**22**	**17.1%**
	3.00	**I somewhat agree**	**19**	**14.7%**
	4.00	**I am neutral**	**14**	**10.9%**
	5.00	**I somewhat disagree**	**3**	**2.3%**
	6.00	**I mostly disagree**	**7**	**5.4%**
	7.00	**I completely disagree**	**5**	**3.9%**

Q20_BI3

		Value	Count	Percent
Standard Attributes	Position	**21**		
	Label	**bi3**		
	Type	**Numeric**		
	Format	**F8.2**		
	Measurement	**Ordinal**		
	Role	**None**		
Valid Values	1.00	**I completely agree**	**58**	**45.0%**
	2.00	**I mostly agree**	**24**	**18.6%**
	3.00	**I somewhat agree**	**13**	**10.1%**
	4.00	**I am neutral**	**17**	**13.2%**
	5.00	**I somewhat disagree**	**4**	**3.1%**
	6.00	**I mostly disagree**	**8**	**6.2%**
	7.00	**I completely disagree**	**5**	**3.9%**

filter_$

		Value	Count	Percent
Standard Attributes	Position	**22**		
	Label	**$CASENUM~=66 (FILTER)**		
	Type	**Numeric**		
	Format	**F1**		
	Measurement	**Nominal**		
	Role	**None**		
Valid Values	0	**Not Selected**	**1**	**0.8%**
	1	**Selected**	**128**	**99.2%**

Appendix I: Glossary of Acronyms

ANOVA	Analysis of Variance
ATA	American Telemedicine Association
AVE	Average Variance Extracted
BSFC	Burden Scale of Family Caregivers
BYOD	Bring Your Own Device
CCSS	Common Core State Standards
CHES	Certified Health Education Specialist
C-TAM-TPB	Combined Technology Acceptance and Theory of Planned Behavior
DOI	Diffusion of Innovation
EBMeDS	Evidence-Based Medicine Electronic Decision Support
EFA	Exploratory Factor Analysis
EMR	Electronic Medical Records
ERP	Enterprise Resource Planning
HBM	Health Behavior Model
HIT	Health Information Technology
IS	Information Systems
IT	Information Technology
KMO	Kaiser-Meyer-Olkin

LOA	Law of Attrition
MHC	Mental Health Counselors
MM	Motivational Model
MPCU	Model of PC Utilization
MTM	Mark to Market Matrix
OER	Open Educational Resources
ORC	Organizational Readiness for Change
PCP	Primary Care Psychologist
PDA	Personal Digital Assistant
PEOU	Perceived Ease of Use
PLS	Partial Least Squares
PU	Perceived Use
SCT	Social Cognitive Theory
SEM	Structural Equation Modeling
TAM	Technology Acceptance Model
TOE	Technology Organization-Environment
TPACK	Technological Pedagogical Content Knowledge
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
VU	Voluntariness of Use
WBQAS	Web Based Question and Answer Services