ACCEPTANCE AND DIFFUSION OF EDUCATIONAL TECHNOLOGY INNOVATIONS: CHANGE AGENCY OF INSTRUCTIONAL SUPPORT PROFESSIONALS

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ACCEPTANCE AND DIFFUSION OF EDUCATIONAL TECHNOLOGY INNOVATIONS: CHANGE AGENCY OF INSTRUCTIONAL SUPPORT PROFESSIONALS by Robert Wayne Jones, May 2018

ABSTRACT

National narratives pushing distance education, online courses and degree programs, and a competency-based education have led to enlarging staffs of instructional support professionals (ISP) that accompany significant technological shifts to aid in diffusion and support. This study investigated the influence of ISP roles on behavioral intentions of college of business faculty to adopt educational technology generally as, 1) whether change agents provide value in the decision process, 2) how change agency contributes to the overall acceptance of educational technology, and 3) the effect of including change agency in acceptance models. The study design was a quantitative, non-experimental correlational survey as cross-sectional research to examine interrelated dependencies in a conceptual model. Partial least squares structural equation modeling (PLS SEM) was used to evaluate an extension to the Unified Theory of Acceptance and Use of Technology (UTAUT) model, incorporating ISP change agency and functional support roles. The findings contribute to literature on technology adoption and diffusion in the context of business faculty. Antecedents external to faculty adopters' internal support and social system are identified with successful inclusion of external factors demonstrating influence of external agents in the decision process and providing a direct link to the context of diffusion. The findings also signal that ISP practitioner preparation standards should place a greater importance on preparing ISP for their role in change agency, as these skillsets are critical to ongoing success and acceptance of the profession as an effective tool for influencing change higher education.

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DEDICATION

Dedicated to Arthur Guinness (1725 – 1803) for the wonderful stout that carried me through this long writing and reflection process and helped form an initial bond between my beautiful wife and myself at the beginning of our journey.

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I extend words of love and gratitude to my wife, Courtney, for her unbelievable understanding, patience, encouragement, and support throughout this long and often stressful process. To my son, Eli, for whom I started this long educational journey, and step children, Jordan and Jakie Stites, may each of you achieve whatever you set out to do in life and love every moment. To Lucy who reminded me to take a break and play or belly rub every now and then. To my parents, thank you for teaching me life lessons, encouraging creativity balanced with logic, and instilling in me an appreciation for learning to overcome obstacles.

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I wouldn't be where I am without all of these important people in my life, education, and career. Thank you, all.

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UALR Institutional Review Board

DATE: October 4, 2017

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CHAPTER ONE — INTRODUCTION

With shrinking higher education support from the states and federal government, institutions turn to faculty to teach larger course sections to generate more student credit hours and thus tuition revenue to offset declining appropriations (Schalin, 2014; Vedder, 2011). Faculty are expected to do more with the same or fewer resources at their disposal while maintaining research and service commitments. Institutions, in turn, develop strategic plans to expand their geographic service areas through distance education and the establishment of technical and support systems meant to enable faculties' increased credit hour production (Savoy & Carr-Chellman, 2014); however, evidence of cost-effectiveness of educational technology is generally lacking in support of this vision (Levin, 2015). The result is an overworked and overwhelmed faculty unable to keep up with the instructional and institutional technology trends and demands of students and administration, while also maintaining current expertise in their academic disciplines.

The increasingly technological and industrialized nature of college instruction has led to a trend of increased institutional hiring of instructional support professionals (ISP) (e.g., instructional designers, academic technologists, instructional media specialists, etc.) intended to assist and enable faculty in the development of instruction in support of the goals of institutions (Kwak, 2016). However, in many instances, administration manages these support professionals rather than faculty. When the vision of administration and faculty differ, ISP are caught between meeting the needs of the faculty and supporting institutional initiatives (Rubley, 2016). As change agents, ISP operate with "one foot in each world" and thus become a "marginalized figure" in both (Rogers, 2003, p. 368). When the needs and views of the faculty conflict with overarching institution initiatives, these support professionals become caught between the two

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sides of the institution. This conflict can stifle diffusion of instructional innovations and complicate the expanding the role and scope of ISP at the intersection of faculty, instruction, technology adoption, and institutional environments.

Background of the Problem

Institutions' distance education initiatives, most prominently online courses and degree programs, and a national narrative pushing competency-based education and degrees have driven much of the current trend for hiring cadres of instructional designers, educational technologists, learning management system support, and the myriad of other roles that accompany a significant technological shift. The pace at which instructional technologies change has been substantial. Learning management system providers deliver new versions, patches, and upgrades on a rapid schedule to stay competitive and "innovative". Likewise, instructional subsystems, such as lecture capture systems and presentation technologies, keep pace with the marketplace. The convergence of these facets of technology and instruction create a pattern of rapid complication.

While many of these systems were developed, initially, to support distance education initiatives specifically, these systems have become ubiquitous in the college environment, generally. Students have come to expect the technological developments of society to be present in their courses and college experiences. Institutions have met these student expectations by promoting the use of technologies, originally distance-education centered, in face-to-face classrooms. No longer are these technological hurdles reserved for the early adopters; technology adoption and frequent change is regularly thrust upon all faculty as a result of a technological change in an evolving education environment (Ni & Branch, 2008). At the start of any given semester, faculty members will likely be presented with many technological

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challenges *simply* to delivery syllabi. It is this inherent complexity and diversity of technological backgrounds that became the impetus of need in hiring ISP.

Impact of Distance Education on Instructional Production

Distance education in America today is built upon over 120 years of pioneering spirit in providing education to those wishing, or needing, to further their education but could not or choose not to acquire education through traditional routes. The history of distance education in the United States dates back to the 1880s with mine safety lessons delivered through Scranton, PA newspapers (M. G. Moore & Kearsley, 2005). The goal of distance education meeting the needs of students is just about the only construct that has not changed in 120 years. As society and available technologies have evolved, distance education providers have evolved as well.

In this long history, many changes have occurred in distance education. These changes have included everything from the types of institutions that deliver distance education, to the mediums and technology that supports education at a distance (Spector & Ren, 2015). Of these changes, technology has been the most common and challenging changes. In my definition of technology change, I not only include technologies such as the transport medium (e.g., paper, television, or Internet) but also the supporting technologies (e.g., learning management systems, interoperability standards, course development tools, and technological supports of pedagogies). It is these supporting technologies that are often considered to be most influential and diverse in effecting changes in recent distance education history and the future of higher education faculty concerns.

Wedemeyer (1981) stated, "educational technology is chiefly an adaptation to education of technologies drawn from other fields" (p. 118). Educators and institutions continue to utilize all five generations of distance education to varying degrees: correspondence, television, multi-

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system, and computer/internet-based. Each generation was an adaptation of existing technologies used in society or other fields. One example, given by Wedemeyer, is that of the *systems approach*, theorized by Moore (M. G. Moore & Kearsley, 2005), which was adopted and expanded upon from engineering fields. In today's information age, advancements are being made in various fields that are contributing to the availability of technologies for distance education (e.g., virtual environments, immersive simulations, learning analytics, social media platforms, etc.) (Bitter & Corral, 2015). While many of these technologies are young in their development, the technologies are primed for exploration by faculty, instructional designers, and other ISP. The dilemma then becomes what technologies should be welcomed into the fabric of higher education; how will these technologies diffuse, contribute to, or restrict pedagogy and faculty/institutional efforts; and at whose purview? For better or worse, these technology evolutions are, as C. M. Christensen and Eyring (2011) termed, *disruptive* to the education environment as a whole.

Rhoades (2006, 2007) posited that changes in the emphasis of higher education toward distance and technology-enhanced instruction have created an emergent type of instructional production. This mode of production involves an ongoing institutional investment in managerial and support professionals to build capacity and infrastructure to develop, deliver, and support new instructional delivery paradigms. Dirr (2003) observed the same faculty issue with unbundling of traditionally faculty-centered roles to those of managers, professionals and outsourced contracting. The observations of both Rhoades and Dirr mirror predictions and optimal industrialized systems identified by Peters (1983, 2010), Wedemeyer and Brandenburg (1963); Wedemeyer and Najem (1969), and M. G. Moore and Kearsley (2005).

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Professionalization of Instructional Support Discipline

The complexity of modern technology-heavy instructional environments has created new professions and fragmented ones long established. For much of the history of higher education, the development and delivery of course and curricular content were the sole purviews of the faculty. However, as with the evolution of specializations for other transport mediums (e.g., typesetters for books), the specializations required to fully exploit the abilities of modern instructional systems are expanding. For example, instructional design, as a profession, developed alongside the major education psychology theories and large-scale military training development in the 1940s through the 1960s. The theories and processes of instructional design migrated to private sector training programs and eventually to college environments. However, the role of instructional design remained as a support function, to enable faculty as needed.

In the 1960s the paradigm began to shift as the industrialization of education expanded to higher education. Peters (1983, 2007, 2010) theorized, as early as 1967, that the industrialization of higher education would occur in much the same manner that society had become industrialized. Developments at the University of Wisconsin in 1964 explored technology and industrialization to support the university's mission in extension education within the confines of faculty shortages and limited facilities (Wedemeyer & Najem, 1969). Wedemeyer's experience with correspondence education provided insights into the complexity of alternative delivery modes and informed practice as the university piloted tele-based delivery (Wedemeyer & Brandenburg, 1963; Wedemeyer & Najem, 1969). Wedemeyer and Najem (1969) investigated a development program and conducted extensive research on the systems and support required to deliver education on a large scale. M. G. Moore and Kearsley (2005) systems view of distance education reflects the complexities and economies of scale described by both Peters and

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Wedemeyer to fully describe the ecosystem of systems, human capital, and institutional support required to effectively deliver distance education.

Rhoades (2006, 2007) observed a related pattern in the evolution of managerial professionals as core to the higher education environment. Rhoades (2006) identified a trend of "personnel with advanced degrees who are neither faculty nor senior administration" serving in central roles of instructional production (p. 389). A salient characteristic of these managed professionals, of which ISP are included, are that they are hired, evaluated, promoted, and fired by managers, rather than traditional academic protections afforded faculty. As a result, they are more connected and supporting of the direction and goals of managers.

In distance education, these managerial professionals are intended to support and enable the ecosystem. However, as the system structures of distance education matured and were integrated with the organizational structures of higher education, these professionals increasingly became part of distinct administration-facing centralized support units. Centralization can serve to provide campus support equally across colleges and facilitate diffusion of instructional innovations among disciplines' pedagogical methods. However, centralization has also led to a degree of distrust between faculty and ISP as pushing the agenda of administration, rather than the needs of faculty and students (Rubley, 2016).

The actual size of this ISP workforce in higher education, nationally, focused on instructional support (i.e., direct involvement with the production and delivery of courses), cannot be found in national datasets (Intentional Futures, 2016). National data sets combine all non-faculty instructional support into a single category. This category includes a wide range of academic support functions — from student advising, multicultural offices, departmental administrative support, and many other fields. A recent survey-based report estimates that the

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number of instructional designers alone is in excess of 13,000 in the United States (Intentional Futures, 2016). Additionally, the number of degrees awarded in the instructional support areas is indicative of the sustained growth in the fields. As illustrated in Figure 1, in academic years 2011/2012 through 2015/2016, the number of degree programs offered nationally by both public and private Title IV participating institutions has increased each year (U.S. Department of Education, 2018). Offerings through public institutions have increased at a rate of 16.3% over the five-year period. While private institutions demonstrated a higher growth in the number of programs at 30.7%, over the same period. The graduates of these programs will enter employment with primary, secondary, and post-secondary education, as well as military and corporate organizations. Likewise, as anecdotal evidence of the need for these programs and the trend to incorporate ISP into the higher education environments, over 200 active employment opportunities at four-year institutions are listed on the HigherEdJobs website for “Instructional Technology and Design” on any given day (HigherEdJobs, 2017). While these openings cannot be determined to be replacement or new positions, the substantial number of openings reflect the sustained or growing nature of the role in higher education.

Technological Change, Acceptance, and Diffusion

Much research has been conducted regarding the factors, mediators, and moderators that lead to adoption and continued or discontinued use of technological innovations. Rogers (2003) Innovation Diffusion Theory (IDT) has been widely used to investigate the breadth of processes and influences involved with new innovations diffused within a population. IDT is the “process in which an innovation is communicated through certain channels over time among the members of a social system ” (Rogers, 2003, p. 5) . Communication in diffusion is a two-way process of reaching mutual understanding, either through convergence or divergence of meaning. This

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communication is a type of purposeful social change mechanism to lead a group, or individual members of the group, toward or away from an innovation adoption.

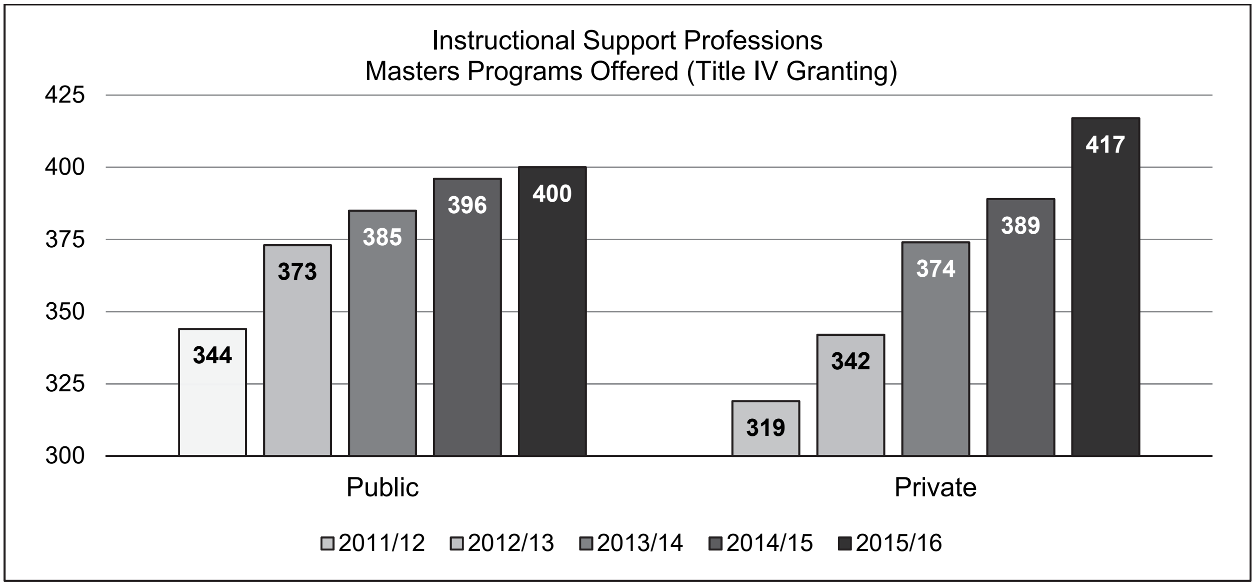

Figure 1. Total number of instructional support degree programs offered by institutional control, academic years 2011/2012 through 2015/2016. Classification of Instructional Programs [CIP 2010] codes: 13.0301, 13.0501, 13.0604, 13.0607, and 13.0699. SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Fall 2011-2015, Completions component.

The four main elements that comprise the IDT process are the innovation, communication channels, time, and the social system. Innovations are ideas, practices, or objects that an individual or group perceive as new or different than that which individual or group currently accustomed (Rogers, 2003). The perception of newness is in the opinion of the potential adopter and is independent of the relative time since invention or prior knowledge of

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the innovation. If an idea, practice, or objects appears new to the individual, it is an innovation to that social group.

The communication channels in which knowledge of an innovation is conveyed requires four components: the innovation concept; an individual with knowledge of, or experienced in, the innovation; one or more other individuals without or limited knowledge of, or experience in, the innovation; and a communication method connecting the knowledgeable individual with the unknowledgeable. These channels are categorized into either *mass media* (i.e., one-to-many) or *interpersonal* (i.e., one-to-one or one-to-few) channels. Mass media is deemed the most effective in rapid diffusion of innovations among a large population, however interpersonal is a critical process in engaging individual opinion leaders and those reluctant to express or act on their opinions. The activities of a change agent are primarily in this communication process.

The time element of diffusion is that length of time that passes from an individual's first knowledge of the innovation through to adoption or rejection. This dimension moderated by the individual or group's relative innovativeness or eagerness toward new ideas. Likewise, the dimension is mediated by the rate of adoption in the social system at a given point in time. As more adopt the innovation, time to adoption decreases. However this adoption rate traditionally follows an S-curve; in which adoption begins slow (until between 10-20% population adoption) then increases until reaching approximately 80% population saturation where the adoption rate slows over time (Rogers, 2003).

The environment of the social system in which all communication and adoption observances occur is critical to the understanding of how diffusions occur, as diffusions occur only within a social system. The social system may be made up of interrelated individuals, groups (formal or informal), organizations, or other entities that share a commonly perceived

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need for or desire to investigate the innovation. Social structure, leadership roles, hierarchies, homogeneity/heterogeneity of the group, and homophily of the individuals within the group, and the influence of change agents play important roles in communication and influence during the diffusion process (Rogers, 2003).

Predictive models of acceptance in technological environments have been developed over the past several decades (see Davis, 1986; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003). These models predict the innovation-adoption decision at the individual level, rather than the social system level as usual with IDT. Models of acceptance were researched out of a need to explore the complex and uncertainty that exists in the decision-making processes related to the adoption of technologies in information systems. At the fundamental level, these models address the decision to accept or not-accept adoption as a result of an individual's perception of several attitudinal factors, such as ease of use, usefulness, and an individual's control of behavioral intent (e.g., up to the individual to decide or mandated adoption).

Davis' (1986) original Technology Acceptance Model (TAM) has been used by many researchers to evaluate and predict acceptance of technologies ranging from social networks and email to student perceptions and faculty perceptions of instructional technologies (see, Sun & Zhang, 2006; Teo, 2011b). Venkatesh's (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) model was an extension of TAM incorporating additional attitudinal factors. While TAM has been successful in predicting adoption success as high as 30%, UTAUT has a predictive capability of 70% (Oye, A.Iahad, & Ab.Rahim, 2014).

A limitation of previous research in technology diffusion and acceptance has been a lack of research into negative results (i.e., technologies not adopted or unsuccessful diffusions of

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innovations). Additionally, research in these areas are predominately one-sided or *pro-innovation/pro-adoption*, where diffusion is investigated from the perspective of a single agent in the process or adoption decision is viewed primarily as an individual behavior. These prior research and acceptance models oversimplify the complexity of the ecosystem of instructional support that exists in higher education today.

Implied Change Agency in Instructional Support Roles. Change agents are individuals who influence the individual or social system's innovation decisions in a direction deemed desirable by the agent (Rogers, 2003). The direction may be to promote or speed up the rate of adoption; however, the direction may also be too slow down or influence rejection of the adoption. The role of ISP are often viewed as change agents, in addition to the essential support function they perform (Rubley, 2016). Change agency occurs when the support professionals act in a manner that promotes one technology or process over another, either as a direct result of institutional priority, trends in education or their respective disciplines, or new additions to the body of knowledge. This agency can act as a cross-discipline diffusion mechanism and moderate/mediate technology acceptance and use, both positive and negative, at the department, college, campus, or national levels.

While the impact of ISP is often measured in productivity and end-result outcomes, change agency effect has not been examined. As previously described, diffusion usually occurs along an S-curve of adoption patterns. In this pattern, depending on when the individual adopted an innovation, adopters are grouped as innovators, early adopters, early majority, late majority, and laggards. In this researcher's experience, ISP have very little involvement with innovators, as these adopters try new innovations without assistance. Likewise, early adopters begin accepting the innovation without change agency of the ISP; however instructional support is

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focused on assisting the adopter implement their decisions (i.e., the explicit role of support). Innovators and earliest adopters are not often considered opinion leaders in the social system of the innovation-decision process, as they are viewed as deviants to the norm of the group (Rogers, 2003). Opinion leadership is earned and must be maintained through expertise and technical competence, social accessibility, and conformity to the social system's norms. ISP are expected to pursue the role of opinion leader through technical expertise in instructional technology and formal pedagogical training. However, as Rhoades (2006) alluded, faculty are suspect of an ISP *expert* role in his statement, "managerial professionals … emphasize the use of instructional technologies as a way to advanced their claims to pedagogical expertise" (p. 390). Individual characteristics determine whether this pursuit of change agency through opinion leadership is successful. Individuals' knowledge, communication abilities, and political savvy all contribute to how the ISP is perceived within the social group — a group that the ISP may not have regular and sustained interaction.

Significance of Research

Historical and current trends suggest that technologies and pedagogical innovations have, and will continue to, rapidly transform higher education. Each area of higher education has unique characteristics that are the core of the discipline, be it research methods, pedagogy, advising, feedback, etc. Disciplines, faculties, ISP, and administration need a better understanding of how technology changes affect pedagogies and established standards in their respective areas. While the successful diffusion of instructional innovations is often a desired outcome — to the benefit of students, faculty, and administration — the process of diffusion and change agency may have unexpected consequences beyond the diffusion of technologies or processes and extend into pedagogy, the scholarship of teaching and learning, and group culture.

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A substantial gap exists in understanding this intersection of administration, faculty, and ISP in an increasingly technology-dependent education ecosystem.

Institution stakeholders have an obligation to understand the effect of the professionalization of instructional production on the direction of higher education. Faculty developing curriculum in instructional support related disciplines have an obligation to prepare ISP for the potential conflicts of change agency and managed professional roles they will fill in higher education. Institutions of higher education have operated in varying levels of unbundled instructional production for decades without an understanding of how ISP influence the direction of the institution, beyond day-to-day support functions. As the number of tenured faculty decline and ISP increase, the importance of understanding how these professionals influence the direction of an academic environment is critical to the balance of shared governance and faculty control of curriculum.

Much of the profession of instructional support has been focused on technology and practices of the discipline, rather than the higher-order effect of the profession's interaction with other disciplines and institutional roles. This research provides insight toward the impact of potential perceived bias of ISP, by faculty, in the diffusion processes affecting or redirecting adoption by faculty and goals of the administration. As a parallel significance, ISP should be cognizant of their potentially contradictory roles of supporting the faculty in the development of effective instruction versus promoting the goals of their management or discipline norms. A great deal of importance is placed on technology and pedagogical expertise in degree programs preparing ISP while lacking preparation in the professional role as a change agent and their role in facilitating diffusion. Knowledge of effective and ineffective interactions or communication

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modes between, and as a mediator of, faculty, staff, and administration are critical to the ongoing success and acceptance of the profession as valuable to higher education in the future.

Failure to understand the active role ISP play in diffusion processes and change agency will result in the continued conflicts in a number of areas. ISP have indicated declines in morale due to the conflicting role they play between faculty and administration. Administrations have miscalculated the effects of ISP as change agents and made assumptions about ISP being afforded an inherent position of an opinion leader. Faculty have indicated a disagreement over the clear delineation of responsibilities in determining the technological direction of curricula. Lastly, standards organizations and ISP preparation programs continue to revise curriculum without a clear understanding of the ISP role beyond the technical and professional skill sets. Considering the continued march and emphasis toward technology-enabled and enhanced curriculum, institutions of higher education cannot afford to proceed uninformed regarding the role of ISP in the education ecosystem.

The current research investigated the effect of instructional support as faculty-initiated support and that of change agency on both successful and unsuccessful diffusions of instructional innovations in higher education, extending the body of knowledge in technology acceptance decisions – both in higher education and information systems, generally –, diffusions of innovations, and professional roles and preparedness of instructional support candidates. Specifically, the research focused on the contrasting roles of ISP in the areas of change agent and support in relation to facilitating diffusion and acceptance of instructional innovations among faculty in colleges of business. The findings inform administrative policies and practices of the limitations facing ISP in the role of change agent and support, as well as provide ISP preparation program faculty needed research in the scope of modern ISP skill sets toward change agency and

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diffusion related roles. The next chapter reviews previous research in the areas of ISP preparation, change agency, and diffusion and acceptance theories establishing a research theoretical foundation.

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CHAPTER TWO — REVIEW OF LITERATURE

This chapter reviews the research literature around behaviors in accepting or rejecting technology, at both an individual and group level. Of particular significance is research related to the effect of facilitating conditions in faculty acceptance and adoption of technologies for academic use. Foundations in the role of ISP, individual and group behaviors, socio-cultural and agent influences, and how these foundations inform theoretical models of technology acceptance are included in the review. Collectively these foundations help to explain the context of agency influence and support conditions toward acceptance.

The breadth of roles and preparation for ISP is reviewed in detail to illuminate gaps in preparing for modern environment demands. Change agency, diffusion of innovations, and technology acceptance is reviewed in depth as well. These reviews complement the notion of preparation gaps for ISP in modern educational technology-rich organizational environments, as described in the preceding chapter. Together these knowledge domains provide foundational premises for exploring the impact of ISP' role in change agency within organizations at the individual adopter (i.e., faculty) level.

The Role of Instructional Support Professionals

The Director of the Office of Educational Technology at the U.S. Department of Education stated, "there is a more serious digital divide that we face in this country, and that is the divide between those who know how to use technology to reimagine learning and those who simply use technology to digitize traditional learning practices" (Culatta, 2014, 0:40; Kwak, 2016). This statement points to the overarching push to innovate and re-invent academics in the context of new technological developments. The concern for an increasing need for those who can use technology has been repeatedly echoed in EDUCAUSE's annual survey of top IT issues

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in higher education (Grajek, 2014, 2015, 2016, 2017). As of 2016, the second highest identified issue is optimizing educational technology. Or, as Grajek (2016) stated, "Collaborating with faculty and academic leadership to understand and support innovations and changes in education and to optimize the use of technology in teaching and learning, including understanding the appropriate level of technology to use" (p. 12).

Instructional design, a focused profession with-in ISP, is the most mature and researched ISP; therefore, serves as the baseline in this study for identifying what types of preparation is afforded to potential professionals, standards of practice, and certification. Instructional design refers to the "activities involved in generating intentional changes in learning and performance, including planning, creating, selecting, sequencing, and developing resources" (Tracey, 2015, p. 389). The activities associated with instructional design occur in a variety of settings, from government and military agencies, private sector corporations, public K-12 schools, and higher education, to name a few. Instructional designers apply their skills also in a variety of technology settings, from face-to-face instruction, distance education, social networks, and various medias (Tracey, 2015). ID professionals are "change agents altering knowledge, skill, or the performance of the learner and work in numerous social and cultural contexts" (Tracey, 2015, p. 389).

Preparation of potential instructional designers includes a wide variety of programs, including workshops and formal academic programs from bachelor's to doctoral programs (Spannaus, 2015). All preparation is focused on imparting the knowledge, skills, and attitudes needed to be successful in the profession; however for the purpose of this study, this study situates *preparation* in terms of academic programs, as the master's degree has been the expected entry preparation for professionals since the 1940s (Spannaus, 2015), as exampled by

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greater than 94% of ISP reporting obtaining a master's or higher degree (Linder & Dello Stritto, 2017).

Certification and licensure are also potential preparation avenues, although they function as an alternate verification, or *credentialing*, of knowledge, skills, and attitudes. Both certifications and licensure can take place independently of, concurrently with, or sequentially after formal academic programs. Certifications are a voluntary achievement in most instances, with obtaining a certification as an added independent verification credential in addition to the academic preparation. Licensure is mandatory in some work environments to perform instructional design or educational technology-related duties, for example in K-12 environments.

Accreditation of programs in ISP are not consistent nationwide. Depending on the university, college, or department structure, a preparation program in instructional design, educational technology, or related sub-focuses of ISP greatly affects the generality or specificity of the accreditation expectations required. Additionally, dependent upon how the program is marketed (e.g., toward K-12 teacher preparation, licensure, or similar) state or federal regulations may apply to how programs are accredited.

Generally, accreditation standards, preparation programs, and certifications/licensures follow one of the handful of competency models within ISP. The International Board of Standards for Training, Performance and Instruction (IBSTPI) is the most well-established model within the ISP fields and is reviewed later in this chapter (Carliner, 2015). The IBSTPI model has informed numerous later competency models, to include both the Association for Educational Communications and Technology (AECT) and the International Society for Technology in Education (ISTE) (Carliner, 2015; Wolf, 2015). Both AECT and ISTE form the

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specialized program accreditation for the Council for Accreditation of Educator Preparation (CAEP, formerly National Council for Accreditation of Teacher Education [NCATE]).

Two recent comprehensive surveys of ISP and faculty in higher education on the role, workflow, and experience of instructional designers have been promoted as a key resource for institutions looking to improve learning outcomes (Intentional Futures, 2016; McGuire, 2016). These surveys are of the more comprehensive profiling of the profession by inquiring with the profession directly. Unlike academic preparation program content and professional standards organizations, responses from professionals illustrate and illuminate how diverse the profession is, what roles they play, and experiences with difficulties in the organizations. Illustrative of the size of the profession is the survey authors' estimate that there are over 13,000 instructional designers currently active in U.S. higher education. Contrast this workforce to over 1.5 million full- and part-time faculty in the U.S. — a 1 to 119 ratio of ISP to faculty (National Center for Education Statistics, 2016).

The Intentional Futures survey of 853 ISP, as with previous surveys, identified that instructional designer job descriptions demonstrated very little uniformity across institutions nor do their backgrounds exhibit any common career path (McGuire, 2016). However, there were strong similarities among their academic preparation and experience. A master's degree was earned by 87%; while 32% had an earned doctorate (Intentional Futures, 2016). Eighty-seven percent of respondents indicated 3 to 11 or more years of instructional design experience. Additionally, over half of the respondents indicated they had 3 to 11 or more years of higher education teaching and technology development experience. Demographically, respondents were 67% women and an average age of 45.

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So, if the job descriptions of ISP vary widely, what do they actually do? There is a general misconception that ISP are "glorified IT personnel who simply move courses online" (Intentional Futures, 2016, p. 3). However, of respondents, only 20% reported that creating courses is a daily activity. A much greater proportion, 73%, reported that project management (e.g., course revision timeline tracking, verifying project delivery dates, planning evaluations, and reporting statuses) is a daily task. Training faculty in technology or pedagogy represented 60% and 49% of activities. reported Based on respondents' task reporting, ISP responsibilities were categorized into four areas: Design, Management, Training, and Support (Intentional Futures, 2016). Design duties included activities such as designing new or redevelopment of old courses, authoring instructional content, and quality or functional testing of courses and media. Management included functioning as a project manager, promoting and advocating, and liaison activities between administration, faculty, information technology, and other constituents. Training faculty included technological and pedagogical training as well as faculty professional development in course design, assessment, and related concepts. The support role most closely resembled the "glorified IT" role, which included learning management system helpdesk-type support, resolving issues related to educational technology, and ad hoc support in migrating course content. While all the respondents' tasks were grouped into these areas, the mix of areas for a given respondent was mediated by their level of experience and managerial role. The role of ISP in higher education has expanded beyond the traditionally understood purpose of helping faculty create courses (Rubley, 2016).

Faculty and ISP were not in agreement over what those roles entail, with only 29% of faculty and 16% of ISP agreed upon the roles they play in the process (Rubley, 2016). This disagreement could contribute to non-collegial relationships; however, 67% of faculty and 73%

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of ISP report that their interactions were collegial. Regardless, substantial disagreement exists between faculty and ISP of which party is in charge when it comes to various activities related to technology in learning environments. Faculty respondents indicated some benefits to working with ISP than working without ISP, however, these benefits clearly have room for improvement. Forty percent of faculty believed more strongly in the power and potential of technology in teaching and learning as a result of working with an ISP. Only 36% reported that ISP support enabled them to efficiently adapt courses for online. Additionally, only 30% believed that working with ISP helped them focus more on teaching and engaging with students, as opposed to being distracted by technology. In terms of ISP facilitating faculty in using technology for learning in teaching, it appears that 60-70% of ISP intended effort is not achieved.

ISP work with a wide-ranging collaborative circle. Many ISP reported working with librarians, students, educational technology providers, media specialists, and information technology specialists at least once a week (Intentional Futures, 2016). However, of interest to this study, ISP collaboration with faculty and administration is substantial. The majority (94.9% and 84.8%) of ISP report interacting with faculty and subject matter experts at least once a week, with a substantial number interacting on a daily basis (78.1% and 62.4%, respectively) (Intentional Futures, 2016; Linder & Dello Stritto, 2017), with collaboration most frequently related to online or hybrid course development (Rubley, 2016). While the scope of what constitutes a *subject matter expert* is not defined in the report, one can assume that in higher education the experts are directly related to the course content decisions. However, a survey of 2,360 faculty indicated only 23-25% of faculty have worked with ISP (Inside Higher Ed, 2017). ISP reported interacting with the administration on a much lower frequency that that of faculty

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— 68.4% weekly and 33.6% daily. While ISP are predominately managed and directed by the administration, the primarily faculty-facing role of ISP are represented in these responses.

Respondents also identified several obstacles in successfully meeting expectations. ISP reported difficulty working with faculty (28.4%) as the number one identified barrier to success, followed by time constraints (19.5%), resource constraints (15.2%), and leadership and administration (14.3%) (Intentional Futures, 2016). The proportion of ISP reporting faculty-based barriers as a greater obstacle than that of administration-based barriers is significant, $z = 6.682$, $p < .001$. The greater emphasis on faculty-based obstacles can be expected by the higher proportion of faculty over administration interactions on a daily or weekly basis, $z = 16.810$, $p < .001$ and $z = 12.815$, $p < .001$, respectively.

A general lack of understanding by faculty and administration about the role of ISP has been identified as a contributing factor in the barriers to success (Intentional Futures, 2016; Rubley, 2016); however given that the profession itself also has difficulty in delineating the role, this misunderstanding is double edged. The administration was also faulted as a factor in barriers in the areas of miscalculating implications of initiatives and integration structures. One respondent captured the common narrative of these miscalculations:

> Administrators above my level who do not have an education or instructional design background impose the latest and greatest technology on my work. They often learn about the cool new thing and see it as a silver bullet without the considering the true cost (not just financial) of implementation. (Intentional Futures, 2016, p. 15)

Additionally, the respondents identified a lack of planned structures to integrate and promote faculty and ISP collaboration. Combining the barriers of administrations' technology

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decision implications with a lack of strategy in integrating the expertise of both faculty and ISP, leads to ISP to assume the role of advocate and liaison. Improved collaboration is needed in campus prioritization of faculty and ISP interactions (Rubley, 2016).

Respondents identified the importance of various skills as very, somewhat, or not important. The top six skills identified, based on a combined percentage of *very* and *somewhat* important, were: learning new technologies (99.2%), project management (98.0%), learning science/theory (94.9%), instructional design models (92.7%), strategic planning (92.4%), and teaching experience (88.4%) (Intentional Futures, 2016). Other skills identified focused primarily on the technical aspect of the roles, such as multimedia production, data analysis, graphic design, and coding. Interestingly, the only skill identified that directly relates to the management role was project management. Other skills, such as collaboration, communication, or other interpersonal skills, which directly relate to the promoting, advocacy, and liaison duties are conspicuously omitted. Highlighting that, even in the profession, that role is implied rather than an explicit function.

Forty-eight percent of ISP believed that they "effectively persuaded faculty of the power and potential of technology in teaching and learning" (Rubley, 2016, p. 14). However, only 34% indicated that they had effectively persuaded administration of the same. A great disconnect existed between administration initiatives toward technology enhanced learning and execution of those initiatives through the academic systems. Forty-nine percent of faculty and 37% of ISP indicated that administration encouraged faculty to use technology in teaching and learning (Rubley, 2016). However, only 25% of faculty and 32% of ISP believed that faculty were provided enough support to use technology. As a respondent stated, "administration tends to believe that it should be as easy as adopting a new textbook .... Therefore, they tend to

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underestimate the support needed to use technology effectively" (Rubley, 2016, p. 16). Given that ISP are highly educated with a great deal of experience and interact with faculty at a much higher rate than that of administration, there should be a clearer understanding in organizations on how these professionals fit into the academic efforts. As has been described, the intentions of ISP and administration are overwhelmingly lost in execution with faculty. Universities need to build partnerships across and between faculty and ISP to leverage technology and learning sciences (Kwak, 2016).

Standards of Practice

As a specialized discipline within education, the instructional support profession has evolved to include numerous organizations who develop standards of practice. These standards inform not only the ISP of the expectations of the profession but also faculty who develop and oversee preparation programs. The following review of standards highlights those areas related to change agency in educational technology innovations.

International Board of Standards for Training, Performance, and Instruction (IBSTPI). The IBSTPI has published Instructional Designer Competencies and Performance Statements since 1986 (Koszalka et al., 2013). The early standards predated the introduction of personal computers, the Internet, and the myriad of technologies spawned as a result of these innovations. Through the fourth edition of the standards, IBSTPI outlines five domains that all (i.e., *essential* skills), experienced and expert (i.e., *advanced* skills), and *managerial* instructional designers are expected to master; although admittedly "few instructional designers, regardless of their level of expertise, are able to successfully demonstrate all ID competencies" (Koszalka et al., 2013, p. 19). The Instructional Designer Competencies and Performance Statements have been identified as the core set of standards in which other standards bodies (e.g., Association of

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Educational and Communication Technology [AECT], Academy of Human Resources Development [AHRD], and American Society for Training and Development [ASTD]) and accreditation bodies (e.g., CAEP and ISTE) are based upon (Carliner, 2015; Koszalka et al., 2013). In development of the standards, IBSTPI warns that the profession, "must be careful not to turn [instructional design] into a movement that refocuses [on] production or information technology specialists" (Koszalka et al., 2013, p. 5), rather instructional designers should possess the competencies critical to supporting the entire ecosystem of education and outcomes. The IBSTPI standards include 150 performance statements, therefore the following overview focuses on domains and statements directly associated with change agency in the ISP scope (see, Koszalka et al., 2013, for full standards). By reviewing the core competes of instructional design professionals, in the context of research-based international standards, the commonly understood role of ISP in the change agency and diffusion processes are illuminated.

The domain of Professional Foundations, see Figure 2, recognizes that, as a profession, the field must be able to communicate with other design team members, subject matter experts, and administrators, to name a few roles in which effective communication must be maintained. In addition to commonly recognized communication skills (e.g., write and edit, deliver presentations, and so forth), IBSTPI states, "instructional designers *must* [emphasis added] be skilled at negotiating and resolving conflicts, as well as facilitating collaboration and building consensus" (Koszalka et al., 2013, p. 33). *Must* would allude a mandatory or necessary skill; however, in contrast, the following performance standards indicate that those communication skills are applicable only to experienced or expert instructional designers.

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1. Communicate effectively in visual, oral, and written form (*essential*).

    ….

    g. Use effective collaboration and consensus-building skills (*advanced*).

    h. Use effective negotiate and conflict resolution skills (*advanced*).

Figure 2. Instructional Designer Professional Foundations performance statements excerpt. From *Instructional designer competencies: The standards*, (4th ed., p. 24), by T.A. Koszalka, D.F. Russ-Eft, R. A. Reiser, F.A. Senior Canela, B.L. Grabowski, and C.J. Wallington, 2013. Charlotte, NC: Information Age Publishing.

The competency domain of Planning and Analysis, see Figure 3, represent the systemically analysis role of instructional designers in developing and promoting enhanced learning interventions. Of the 25 performance statements outlined in the standards, this researcher has identified eight which align with the change agency role of ISP (listed below). Of these eight statements, only two have been selected by IBSTPI as an essential skill that every instructional designer should master. The reasoning stated by IBSTPI is sound, "designer success is increasingly as dependent on being sensitive to the social morays and culture of an organization as it is having a strong knowledge of needs assessment tools and techniques" (Koszalka et al., 2013, p. 40); however as with the communication skills discussed, there is a disconnect between the narrative of importance with that of professional diffusion of the skills at entry level.

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6. Conduct a needs assessment in order to recommend appropriate design solutions and strategies (*advanced*).
    a. Identify varying perceptions of need among stakeholders and the implications of those perceptions (*advanced*).
    ….
    d. Synthesize findings to identify and recommend potential instructional and noninstructional solutions (*advanced*).
    e. Estimate costs and benefits of possible solutions (*advanced*).

….

9. Analyze the characteristics of existing and emerging technologies and their potential use (*essential*).
    a. Describe the capabilities of existing and emerging technologies required to enhance the impact of instruction (*essential*).
    b. Evaluate the capacity of given instructional and learning environments to support selected technologies (*advanced*).
    c. Assess the benefits and limitations of existing and emerging technologies (*advanced*).

Figure 3. Instructional Designer Planning and Analysis performance statements excerpt. From *Instructional designer competencies: The standards* (4th ed., pp. 25-27), by T.A. Koszalka, D.F. Russ-Eft, R. A. Reiser, F.A. Senior Canela, B.L. Grabowski, and C.J. Wallington, 2013. Charlotte, NC: Information Age Publishing.

The Evaluation and Implementation competency domain, see Figure 4, is a new addition to the Instructional Designer Competencies and Performance Statements with the fourth edition; although evaluation was previously recognized as a competency, the new domain-level identification reflects the competency as a core role of instructional design (Koszalka et al., 2013). Of the competencies included in the domain, areas of implementation and diffusion most closely relate to change agency and diffusion models, generally, and of all the outlined herein

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contain the greatest breadth of relevance. These competencies describe the important aspects of innovation diffusion in the context of the profession. Although each of the statements is focused toward the advanced or managerial role, the clear connection to IDT is apparent in the alignment of change vision, organization dissemination and diffusion, and "strategies to encourage adoption and buy-in" (Koszalka et al., 2013, p. 62).

19. Implement, disseminate, and diffuse instructional and noninstructional interventions (*advanced*).
    a. Create a vision of change that aligns learning and performance goals with organizational goals (*managerial*).
    b. Plan for the implementation of the interventions (*advanced*).
    c. Plan for the dissemination of the interventions (*managerial*).
    d. Plan for the diffusion of the interventions (*managerial*).
    e. Disseminate the interventions (*advanced*).
    f. Monitor implementation, dissemination, and diffusion progress (*managerial*).
    g. Identify required modifications to implementation, dissemination, and diffusion processes (*advanced*).

Figure 4. Instructional Designer Evaluation and Implementation performance statements excerpt. From *Instructional designer competencies: The standards,* (4th ed., p. 29), by T.A. Koszalka, D.F. Russ-Eft, R. A. Reiser, F.A. Senior Canela, B.L. Grabowski, and C.J. Wallington, 2013. Charlotte, NC: Information Age Publishing.

The competencies reviewed focus on the role of instructional designers outside the purely support and technology specialist mindsets. In these roles, instructional designers take on the responsibilities of change agents and facilitating support in meeting not only the needs of learners but those of faculty and administration. Although these competencies clearly outline the

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skillsets needed, there are some inconsistencies between the reasoning behind and the scope of expertise they are targeted. As was highlighted in chapter 1, there is a growing vision that ISP are being placed in the role of change agent at an increasing pace. The profession has come to recognize the importance of facilitating change and that the role of change agent is that of vision building rather than technician (Beabout & Carr-Chellman, 2008), yet the experiences of ISP in the profession are not reflected in the scopes identified in the standards, which indicate that the realities of ISP should only be expected of experienced instructional designers. This leads to three potential misalignments: a) the standards are set at scope too high in expertise, b) formal academic programs are not well aligned with the standards, or c) administration have placed too high an expectation on the profession in terms of relevant skills and experience.

International Society for Technology in Education (ISTE). ISTE released their first standards in ISP in 1998, with the publication of the National Educational Technology Standards (NETS) (Wolf, 2015). NETS prescribed skills for students, teachers, administrators, technology facilitators and technology directors. In 2012, the NETS standards were updated and republished as the ISTE-CAEP standards (International Society for Technology in Education (ISTE), 2017) — coinciding with the 2012 update of the IBSTPI standards. The ISTE-CAEP standards serve not only as an accreditation tool, but also are a "benchmark guide for local, state, national, and international PK-12 educational institutions" (Wolf, 2015, p. 96). As of 2017, Over 60 graduate programs have been formally recognized by CAEP as aligned with the ISTE standards (Council for the Accreditation of Educator Preparation (CAEP), 2017). While fewer than 8% of the 785 programs identified in the preceding chapter are formally recognized by CAEP as aligned with ISTE-CAEP standards, many more programs claim some form of informal alignment or are guided by the ISTE standards.

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Change Agency and Related Roles

Change agents are individuals who influence the individual or social system's innovation decisions in a direction deemed desirable by the agent (Rogers, 2003). Change agency describes the ongoing functions of adaptation and learning within an organization that attends to not only the explicit change efforts, but also cultural norms, knowledge transfer, and adaptive infrastructure to support innovation decisions and is recognized as a form of leadership (Ellsworth, 2015). *Change agency* is a broader term inclusive of the process, role, and associated actions in leading innovation or diffusion in organizations (Ellsworth, 2015). A change agency is also an entity promoting an innovation; for example, a vendor or higher leadership within an organization or community (Rogers, 2003). In organizations of business, education, non-profits, and government, change agency has been established as "an integral and essential process" (Savoy & Carr-Chellman, 2014). However, as integral and essential as it may be, several descriptions of change agency have evolved over time — from champion to leader to problem solver to influencer (Savoy & Carr-Chellman, 2014). It is this last descriptive, *influencer*, that is investigated further.

The change agent is a key stakeholder in IDT, as the role is attributed with facilitating change through communication of an innovation to potential adopters (Ellsworth, 2015). The role of change agent is multifaceted from influencer to enabler to stabilizer. The main role of the agent is to facilitate "the flow of an innovation from a change agency to an audience of clients" (Rogers, 2003, p. 368). Likewise, agents function as the conduit for feedback about the innovation flowing back from the client to the change agency to adjust the innovation to fit the

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evolving needs of the targeted social system. To function in this role, the agent usually possesses a high degree of expertise in the innovations they are tasked to diffuse.

In addition to the role of influencer, change agents possess several personal characteristics and competencies specific to the change process. Through research on corporate environments, Ulrich (1997) identified six required of the agent to be effective in change processes: a) diagnose problems; b) build relationships; c) vision articulation; d) setting leadership agenda; e) problem solving; and f) implementation of plans. Zaltman and Duncan (1977) further believed it was the role of the agent to, "develop a climate for planned change by overcoming resistances and rallying forces for growth" (Zaltman & Duncan, 1977, p. 46). In corporate environments, Brown (2010) also identified five attributes needed for a change agent to effectively influence change: a) ability to build strong credibility; b) focusing on meaningful dialog; c) collaboration seeking; d) educate and network with potential adopters; and e) capitalizing on opportunities afforded them. Fullan (2001) believed that agents possess moral purpose, understanding for change, relationship builder, knowledge creation and sharing, and coherence characteristics. Lastly, it has been highlighted that change agents must possess the ability to motivate others, possess political savvy, and knowledge of how to secure resources and support required to facilitate implementation (C.-L. Lee, Yen, Peng, & Wu, 2010).

In facilitating the flow of information between change agency and participant in the diffusion process, the change agent serves as a bridge between the two populations. The social aspects of change agents and efforts "must always be kept front and center" (Havelock & Zlotolow, 1995, p. 7) when establishing diffusion. This bridging function places the agent in a position of "social marginality" (Rogers, 2003, p. 368), in that they are not wholly part of either population. This duality of conflict also introduces the potential for information overload. A

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large amount of information originating from the change agency and the feedback loop can create situations where the change agent receives excessive and conflicting communications between the populations, resulting in communication breakdowns. Experienced change agents possess the ability to selectively transmit relevant information between populations or aggregate (Rogers, 2003). The potential stress and personal downfall of a change agent are well illustrated as:

> One of the greatest pains to human nature is the pain of a new idea. It makes you think that after all, your favorite notions may be wrong, your firmest beliefs ill-founded .... Naturally, therefore, common men hate a new idea, and are disposed more or less to ill-treat the original man who brings it. (Bagehot, H. Physics and Politics, 1873 p. 169, as cited in Rogers, 2003)

In Rogers' (2003) perspective, a change agent introduces an innovation to a system through a seven-step process. This process involves 1) developing a need for change, 2) establishing an information exchange relationship and rapport with the system, 3) diagnosing problems encountered by the system during the adoption, 4) establish an intent to change and motivate toward adoption, 5) translate intent into action through persuasion and influence, 6) stabilization of adoption and prevention of discontinuance, and 7) develop a self-renewing or self-reliant innovation culture — effectively putting the change agent out of business. In the view of the change agency, the failure of a diffusion effort rests with the change agent. However Rogers' (2003) generalization contradicts this viewpoint, "change agents' success in securing the adoption of innovations by clients is positively related to the degree to which a diffusion program is compatible with clients' needs" (p. 375). Thus, the agent is placed in yet another precarious duality of blame.

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According to Rogers (2003), change agents, "are usually professionals with a university degree in a technical field needs" (p. 28). This technical preparation usually precipitates future heterophilous statuses with participants of diffusion processes. A distinctive problem within diffusion processes is that the various participants within the process are quite heterophilous, in that the sub-cultures of the diffusion process (e.g., the technical vs uninformed) create language barriers in communication. Change agents are, generally, more technically competent in and informed of the innovation which they are promoting, as compared to the agency encouraging the innovation (i.e., organization administration) and the potential adopters (i.e., faculty) (Rogers, 2003). These differences lead to communication barriers due to the differences in the skill sets. In contrast, when the participants are considerably homophilous (e.g., have similar levels of technical and innovation knowledge) the diffusion communication barriers exist as well, in that there is little to no knowledge to exchange between the participants. This conflict in equal knowledge levels is reflected in the notion that, referring to the diffusion S-curve, innovators and the earliest adopters exhibit higher levels of technical competence and knowledge of innovations, and thus the role of a change agent in communication is reduced. Optimally, for change agency and diffusion to be effective, some degree of homophily needs exist to create trustworthiness and social credibility (Rogers, 2003), as change agents are not only technical experts in the process they must also be social "people movers" (Havelock & Zlotolow, 1995, p. 7).

There are other roles within the diffusion process that bear some similarity to the role of change agent. Opinion leadership, or *opinion leader*, describes the degree in which an individual in the diffusion process has the ability to influence other participants attitudes or behavior (Rogers, 2003). This influence can be exhibited in favor of or in opposition to the innovation.

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This role is distinctively different than the change agent, in that the opinion leader is an insider to the social norms of the group of participants and is capable of exercising influence from within. An opinion leader can lose their status, if they deviate too far from the social norm of the group, begin to behave like a change agent, or lose credibility through a perceived over-influenced relationship with the change agent. Additionally, Havelock (1995) described the potential for change agents originating inside the social norm; contradicting the traditional view that change agents are external to the group and thus are not part of the group's communication and influence network (Rogers, 2003). In Havelock's (1995) view, anyone intervening in problem-solving efforts in the manner of catalyst, solution giver, helper, or resource linker is functioning as a change agent. This ad hoc change agent viewpoint — where someone *becomes* an agent in a process — is in stark contrast to the professional and intentional role of change agent considered by Rogers.

Rogers' (2003) generalizations include, "earlier knowers of an innovation have more contact with change agents than do later knowers" (p. 174). *Early knowers* are distinct from innovators and early adopters in that they only are aware of the innovation at an early stage in the process. They may or may not have intention to adopt the innovation, but they do possess some characteristics of becoming an opinion leader. Considering the high degree of contact a change agent has with early knowers, change agents' skills and communication abilities can contribute to how these participants view the innovation and consequentially share attitudes within the social system.

As reviewed later in this chapter, a property of a diffusible innovation is that of *trialability*. In most circumstances, the potential adopter needs to either trial the innovation or be convinced that the adoption of the innovation is reversible. However, in the context of opinion

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leaders and early knowers, if these participants trial the innovation and share the results with the social system, this "trial by peers" can provide a mechanism for future adopters to consider the innovation trial a success by proxy (Rogers, 2003, p. 177). The successful trial and adoption by opinion leaders and early knowers is of paramount importance to the change agent in rapidly diffusing the innovation to their peer networks.

Change Agency Research

Change research has included diffusion of innovations, (see, Rogers, 2003; Spiering & Erickson, 2006), obstacles in change, drivers of change, and the participants of change (see, Nelson, Brice, & Gunby, 2010; Rogers, 2003; Ryan, 1996), as well as the internal processes of change (see, Cawsey & Deszca, 2007; Frambach & Schillewaert, 2002; Rogers, 2003). Research in change agency has roots in rural sociology in efforts to encourage improved agricultural methods (Rogers, 2003; Savoy & Carr-Chellman, 2014). Early research was focused on efficiency and effectiveness toward introducing change in organizations and achieving stability of the change effort (Fliegel & Kivlin, 1962; Ryan, 1996). In the review of grounding theories and models that follow, change agency is embodied in the processes and literature. Rather than a separate review of change agent research, the literature was reviewed in a manner illustrative of the intertwined role of agent and innovation.

Grounding Theories

Theoretical foundations of change agency include individual or organizational change (see, Abernathy & Utterback, 1978; Burke & Schmidt, 1971; French & Raven, 1959; Lewin, 1951), developmental change (see, Banathy, 1991; Hall & Hord, 1987; Hutchins, 1996; Jenlik, Reigeluth, Carr, & Nelson, 1998; Squire & Reigeluth, 2000), and diffusion theories (see, Barge, Lee, Maddux, Nabring, & Townsend, 2008; Beabout & Carr-Chellman, 2008; Borrego, Froyd, &

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Hall, 2010; Ellsworth, 2000; Rogers, 2003; Savoy & Carr-Chellman, 2014). Individual change theories focus on organic change within an organization from the inside. This notion of internal originated change is closely associated with Havelock's (1995) statements regarding change agents identified from within the social system. Developmental change theories present a broader concept of change across an ecosystem. The focus becomes the "ripple effects that cause disruptions (Beabout & Carr-Chellman, 2008, p. 621). This viewpoint reflects upon the idea that as change occurs in one part of the system, additional interdependent or influenced part of the system react and are affected as well. Diffusion theories embrace the more unpredictable aspects that an innovation adoption path may take. Diffusion places the innovation at the center of the research frame, whereas individual and development change center on the problem and process. As the scope of this research is focused on the innovation and the roles change agents play in the process of change, the review of theories and research focused on and related to diffusion theory as the grounding framework.

Innovation Diffusion Theory (IDT)

Diffusion research focuses on the conditions which increase or decrease the likelihood that an innovation will be adopted by a given social system. Diffusion is the process which innovations are communicated through certain channels over time among the members of social systems and Rogers' IDT is the foremost and most highly cited source for foundational diffusion research (Savoy & Carr-Chellman, 2014). In 1962, Rogers (2003) theorized that the adoption and diffusion of innovations across an organization, or system, is primarily caused by gradual communication of information about the innovations through social channels which link members of the organization.

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Rogers (2003) argued that diffusion occurs in four stages: invention, diffusion through the system, time, and consequences. The later three stages are the core of studies in diffusion research — or how the information flows through networks, the nature of the networks, and the roles which stakeholders play in the diffusion regarding timing and communication of benefits and use — to determine the likelihood that an innovation will be adopted.

Rogers (2003) believed that a key focus of innovation diffusion is that the diffusion occurs as rapidly as possible. The intent of rapid diffusion is to improve the potential for members of the system to benefit from the innovation for as long as possible — before it is replaced or re-innovated. In IDT, the innovation subject to diffusion is assumed to be needed or beneficial to the system — or *pro-innovation* (Savoy & Carr-Chellman, 2014). Thus, one of Rogers' focuses in IDT research was that of the speed of diffusion and the characteristics of the processes which encourage or hinder rapid diffusion. One such characteristic is the speed in which an adopter can learn the benefits of the innovation. An innovation may possess inherent properties that make it easy to perceive or experience the benefits. Perceived benefits are achieved through the innovations' observability; while experience through trialability. The perceived or experienced benefits are in relation to real benefits of known innovations, or the relative advantage over what is currently known. Lastly, the inherent complexity or compatibility can further speed up or slow down the innovations implementation and use. These properties can be enhanced or, in the case of a perceived lack of benefit, be negated/corrected through the knowledge and persuasion of the change agent (Rogers, 2003). Communication in the process of diffusion is "rarely neat and orderly; rather, change processes are riddled with tensions, paradoxes, and contradictions that must be addressed" (Barge et al., 2008, p. 356). It is

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this inherent complexity in communicating the change that places the change agent in a difficult situation — irrespective of the benefits or limitations of the innovation in diffusion.

Through research over the past 50 plus years, the innovation adoption process has been identified to occur in five stages with complementary decision phases, see Figure 5 (Rogers, 2003). *Awareness* of the innovation, although lacking complete information about it to make an informed decision — leads to *knowledge*. *Interest* and information-seeking desired by potential adopters — as a result of *persuasion*. *Evaluation* of innovation to determine whether to trial innovation based on current or future perceived need (a potential exit point of the process, if the evaluation is negative) — or a *decision* to adopt. *Trial* of the innovation to determine adoption or discontinuance — *implementation* is necessary to trail. *Adoption*, or continued use, of the innovation, in which beliefs were *confirmed*. Rogers also categorized characteristics present in the adoption process as *perceived attributes of the innovation*, the *type of innovation-decision*, *communication channels*, *nature of the social system* involved, and the *change agents' efforts*. Regarding *perceived attributes*, two factors directly relate to adoptability: *compatibility* and *complexity*. Compatibility refers to the alignment of the innovation intent or perceived benefits with that of the "values, experiences, and needs of the potential adopter" (Borrego et al., 2010, p. 186). Complexity relates to the perceived or actual difficulty in fully adopting the innovation (Borrego et al., 2010) —an innovation perceived as highly complex is observed at a lower adoption rate than that which is perceived as less complex.

The types of adoption decision are exhibited as optional, collective, or authoritarian (Rogers, 2003). Optional decisions are those that are focused on the purview of an individual adopter, with little impact on the system for influence. Collective decisions usually include complex innovations that require support or coordination to arrive at an adoption decision.

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Authoritarian decisions are the notorious top-down decisions to adopt and determine effectiveness during the adoption process. While authoritarian decisions are the more expedient processes, collective decision garners the most support by adopters and have exhibited higher sustained use (Borrego et al., 2010). It should be noted that a decision can be a combination of the decision types. For example, a highly complex innovation may be decided upon by a collective yet require authoritative decision to integrate with another social system to enabled cross-system diffusion.

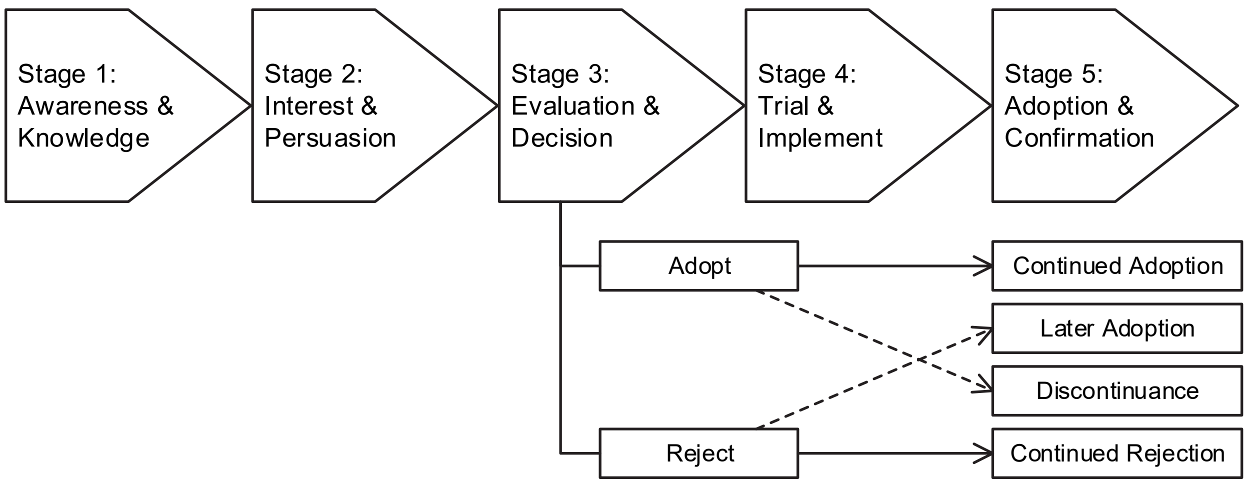

Figure 5. Five Stages and Decision Phases of an Innovation Diffusion Process. Adapted from *Diffusion of Innovations*, (5th ed., p. 171), by E.M. Rogers, 2003. New York, NY: Free Press.

The social system refers to the relational characteristics of the stakeholders within the social system focused on the innovation decisions and adoption process. Rogers identified influential stakeholders in the diffusion process as the opinion leaders, change agents, gatekeepers, and potential adopters. Gatekeepers are members of the social system which monitor external networks for new innovations and communicate the innovation to the social system. In the context of the current research, a gatekeeper may initiate the contact with a

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change agent, function as an innovator in Rogers model, or transition to opinion leader through successes observed by the system. The interpersonal relationships between and among the stakeholders play a key role in diffusion, as Rogers explains:

> The heart of the diffusion process is the modeling and imitation by potential adopters of their near peers' experiences with the new idea. In deciding whether or not to adopt an innovation, individuals depend mainly on the communicated experience of others much like themselves who have already adopted a new idea. These subjective evaluations of an innovation flow mainly through interpersonal networks. (Rogers, 2003, pp. 330-331)

As previously described, these interpersonal relationships among the stakeholders, or network, can be heterophilous which supports the integration of new ideas from outside the social norm although dissimilar personal attributes among stakeholders. Or homophilous which stakeholders are quite similar but with limited new ideas integrated due to the proximal similarities.

Actual adopters of innovations, as opposed to potential adopters or stakeholders, are grouped into five categories: innovators, early adopters, early majority, late majority, and laggards. The distribution of these categories along the diffusion process follows a normally distributed S-curve, in which few innovators adopt in the beginning (2.5%), early adopters following shortly after (13.5%), followed by the equally distributed early and late majorities (34%, each), and lastly the laggards (16%) which are the last to adopt or never adopt (Rogers, 2003).

Researchers have noted competing mechanisms in innovation diffusion which challenge that of Rogers IDT theory. Abrahamson (1991) proposed two additional mechanisms: bandwagon and market. The bandwagon mechanism specifies the social and economic factors which cause an organization to adopt an innovation due to perceived critical mass or competitive

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attributes with peer and aspirant organizations — regardless of the innovations' specific characteristics. The market mechanism specifies the interrelated nature of supply and demand organizations in which the supply side organizations adopt out of influential communications with perceived demand side organizations, or vice versa. While these mechanisms are alternative viewpoints of diffusion processes, they do not integrate the function of a change agent as a facilitating condition. Additionally, these mechanisms would more similarly be associated with the innovation diffusion among and between administrators or ISP, than that of the faculty.

Rogers (2003) also identified five innovation attributes that influence adoption and diffusion rates. *Relative advantage* relates to the perceived degree or impact of beneficial attributes of the innovation under consideration contrasted with that of the innovation potentially replaced. *Compatibility* is the perceived degree of consistency with the needs and values of the social system. *Complexity* is the perceived level of difficulty inherent in the adoption of the innovation; either through the innovations complexity or complexity with integration with existing innovations or social constructs in use. *Trialability* relates to the ability of a potential adopter to experience the innovation with little consequences of an impact if non-adoption paths are chosen, i.e., reversible. *Observability* is the aspect of an innovation that allows potential adopters the option to witness others use, result, benefit, or experiences; additionally, as previously mentioned, strong observability in the context of opinion leaders can replace or augment potential adopters view of the innovation's trialability.

Research Perspectives. As has been indicated, research in IDT is a very wide-ranging field of study. The following studies reviewed focus on the process of change as it would relate to the context of the current study. Two conceptual delineations are presented, the *communication to decision* and *decision to adopt/continuance*. In terms of diffusion, these are

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the core of educational technology adoption within higher education — communicating the innovation and desired continuance of the adoption to benefit faculty and students.

Innovation Communication and Decision in Educational Technologies. Borrego et al. (2010) researched diffusion of education innovations in the context of engineering departments. The researchers investigated the diffusion of established engineering education innovations, discipline and institutional-type differences in diffusion, communication of innovations, and important innovation decisions characteristics. Using a mixed-method survey analysis, the researchers surveyed 257 engineering department chairs regarding seven established innovations (i.e., student-active pedagogy, artifact dissection, service learning, interdisciplinary capstone projects, etc.). Department chairs were selected due to their role in supporting change in engineering education, as opposed to an assumed role as an opinion leader. The respondents (N = 197) represented extensive research institutions (n = 143, 72%), master's institutions (n = 25, 13%), and other institutional categories (n = 29, 15%) — in contrast to the general distribution of Accreditation Board for Engineering and Technology (ABET) accredited engineering programs by Carnegie classification, research institutions were over represented in responses. The sampling mythology employed by the researchers was non-random and self-selection bias was inherent as can be expected in voluntary surveys. Similarly, the researchers noted that response bias toward innovativeness and quality teaching is inherent in the survey, in which chairs who view their departments in this image were more likely to respond.

Of the research findings outlined in the study (Borrego et al., 2010), findings in the area of communication of innovations and innovation decisions are of particular relevance to the current study. Borrego et al. (2010) found that department chairs indicated they learned about the innovations surveyed predominately through colleagues or word of mouth (28%) and through

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presentations on campus or conferences (23%). Additional communication channels include reading articles or books (8%) and presentations at professional societies (3%); while 38% could not recall where they learned about the innovation. The findings in communication channels, where 51% of respondents indicated direct relationships sourced their knowledge, reflects Rogers' emphasis on communication networks, in that interpersonal relationships should be encouraged in the diffusion process.

Open-ended survey responses related to the decisions which influenced the adoption process were thematically analyzed. Three major themes were identified in department chair responses: resources, students, and faculty members. Over half of the responses were grouped into the resources theme — elaborated as "resources, including funding, computers, other educational technologies, classroom and laboratory space, and instructional staff" (Borrego et al., 2010, p. 199). The researchers further elaborated that decisions were often framed as a "cost-benefit analysis" (Borrego et al., 2010, p. 199), whereas the cost of innovation would exceed perceived benefits. Respondents also cited faculty related issues, including faculty time for preparation and labor-intensive innovations, which were frequently mentioned as well as faculty resistance to change and skepticism of improved learning evidence. To a lesser extent, respondents indicated student learning or satisfaction was a factor in the decision. To support decision making, Borrego et al. (2010) recommend that change agents "focus on clients' needs over promoting adoption of a specific innovation" and change agents who are "less committed to specific innovations ... work with faculty and administrators to select innovations and pedagogies that meet the needs of their specific context" (p. 203). Lastly, the researchers recommended, in future research, focusing deeper on a smaller number of institutions to more closely investigate the complex relationships.

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Decision to Adoption and Continuance in Education Technology. Bourrie, Jones-Farmer, and Sankar (2016) researched the critical success factors that influenced (mediated) faculty to adopt and routinely use (or *continuance*) and what factors moderated the adoption. This research was framed in IDT, however, the researchers also incorporated aspects of the TAM and, while not explicitly noted, the UTAUT to inform *a priori* hypothesized relationships. In researching adoption, factors were analyzed regarding openness to change, need for change, appropriateness of change, efficacy to change, support by leadership to change, perceived gain from change, attitude to innovation, awareness of innovation, care for student outcomes, and motivation to innovate. Drawing on TAM, it was hypothesized that faculty's intention to adopt as a significant predictor of actual adoption. Likewise, as is reflected in TAM studies, adoption of an innovation is positively predictive of continuance. Interrelated associations of mediation and moderation of adoption and continuance were drawn from IDT and TAM to predict the influence of culture and environment on the aforementioned diffusion/adoption steps.

Researchers (Bourrie et al., 2016) developed a survey consisting of five areas: educational technologies, dissemination of adoption process, readiness of faculty members, demographic and control variables, and a method of assessing bias in responses. The survey asked faculty five questions about an educational technology related to undergraduate courses that they were currently using, would like to use or planned to use in the future. Five additional questions focused on the process of adoption (i.e., intention, adoption, and continuance) using Likert-type scales of varying point values. Intention to adopt was evaluated via three questions on a seven-point scale. Adoption on single four-point scale item. Lastly, continuance was measured on a single five-point scale; however, researchers recoded the responses to a

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dichotomous value of "I rarely to never use it" or "I always to sometimes use it" (Bourrie et al., 2016, p. 2110).

The readiness of faculty members was measured using 52 items on a seven-point Likert-type scale; which the researchers note as potentially too long and may have introduced pro-innovation bias. The 52-item readiness area was created from a merge of six different survey scales, by multiple authors, extracted from research ranging from organizational change to technology acceptance (see, Bourrie et al., 2016, p. 2110). Bourrie et al. (2016) included 19 demographic items, including five intended as control variables (i.e., gender, race, department, tenure status, and teaching load). Lastly, the researchers introduced a four-item area intended to function as a marker variable for use in detection of inattentive survey completion. The population surveyed included 4,352 faculty in ABET accredited programs, with a survey response rate of 7.98% ($N = 355$). Respondents averaged 15.73 (SD = 11.87) years of teaching experience and had been teaching at their current institution for 12.71 (SD = 10.56) years; while the respondent group had, on average, substantial experience and longevity with the institution, the range of experience and longevity among individuals is widely varied.

Researchers used hierarchical linear regression to analyze hypotheses related to intention to adopt. Hierarchical logistic regression was employed for adoption and continuance hypotheses (due to recoding as dichotomous variables). Results indicated that no demographic variables were related to intent. However, readiness factors were identified as significantly influenced intent to adopt: efficacy to change, perceived gain, attitude toward innovation, and care for student learning. Association between intention and actual adoption was significant in classifying adopters in 81.5% of the cases, with an odds ratio of 2.11 ($\beta = 0.75$, Wald $\chi^2 = 25.49$, $p < .001$) and (R^2) variance explained at 12.3% to 19.5% — a roughly medium effect size.

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Likewise, a model of association of adoption to continuance was significant in that actual adoption accounted for up to 63.8% variance, a large effect (β = 4.44, Wald $\chi^2 = 70.42$, $p < .001$). These findings are in line with research that reviewed regarding TAM and UTAUT; however, intriguingly, Bourrie et al. (2016) did not detect significant moderating effects of the readiness variables on *Intention to Adopt → Adoption → Continuance*. Overall, these findings reinforce the narrative that faculty who have intent, efficacy, and positive attitude toward an innovation are likely to adopt while confirming established links between adoption and continuance.

Scott (2012) conducted qualitative research on faculty adoption of distance education in the context of IDT, in addition to some exploratory analysis. In a case analysis of a high research activity university, the researcher purposefully sampled nine faculty who taught online in a given semester to obtain maximum variation in demographic and experience representative of the institution's faculty population. The institution was selected based on a perceived large number of faculty situated within Rogers' early majority categorization; which creates an assumed trajectory of diffusion processes underway.

The research focused on "Why have certain faculty members ... chosen to adopt online distance education?", "How have faculty members' perceptions of teaching online changed over time?", "How has the adoption of online distance education impacted their teaching role as a faculty member?", and "How do the faculty members' adoption experiences and perceptions compare with one another" (Scott, 2012, p. 55). The researcher's first, second and fourth research focuses directly related to IDT and were the focus of this review. The third focus, while tangential to antecedents of opinion leadership and peer-network communication experiences, was not discussed in the study in such a manner.

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Scott (2012) identified a predominant narrative related to concerns being concentrated around the lack of professional development and training, technology competency (efficacy), and incentives and rewards. However, overarching themes of internal motivation, perceived attributes or advantages, incentives, and social system influences emerged as well. Faculty were initially motivated to teach online intrinsically. Six of the nine faculty experienced distance education through trialability, via hybrid or blended formats of traditional face-to-face courses, as a result, were able to experience various benefits of the mode of instruction that continued adoption processes. Social system influences were identified as influence from change agents and pressure by leadership and administration. These finding complement previous research on the influences of both communication, change agency, and observability/trialability of an innovation within the diffusion process.

Summary. IDT has been used to research and explain innovation adoptions for over 50 years and has remained relatively unchanged through many studies. Researched innovations in the context of IDT have ranged from new corn seeds to artificial intelligence to distance education. IDT explains the fundamental processes and communication frameworks necessary to successfully diffuse an innovation into a social system. Characteristics of an innovation that lend to adoption were also identified. Through a long and well-established scholarship, IDT has become the foundation of technology innovation models that have developed over the past few decades – two of which are reviewed later in this chapter.

Technology Acceptance Model (TAM)

TAM is a theoretical model, see Figure 6, tested to explain how individuals arrive at decisions to accept to use a given technology (E. W. Christensen, 2013). TAM was introduced and is prevalent in information systems research, however, it has been applied in a variety of

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contexts beyond information systems. In many respects, TAM parallels IDT research in information systems. In this review of TAM, where applicable, highlights and parallels in concepts to IDT were made. However, a key contrast between TAM and IDT is the *individual* versus *system* scopes of decisions, respectively.

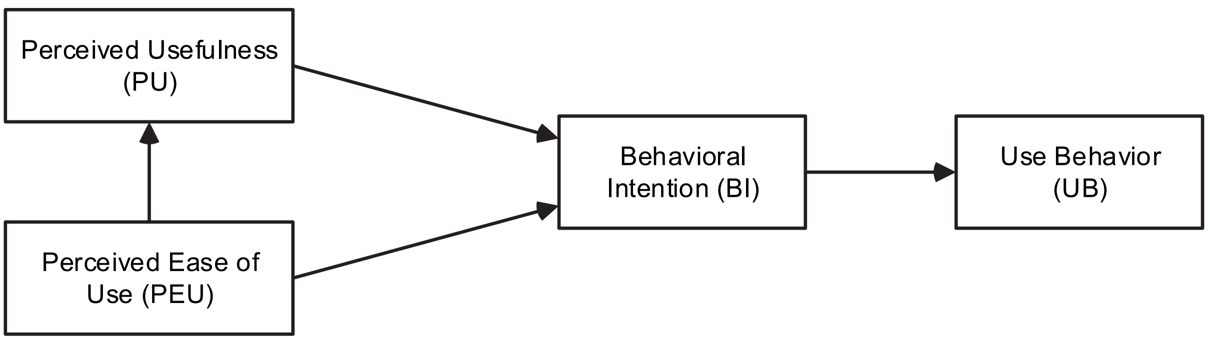

Figure 6. Technology Acceptance Model. From "Perceived usefulness, perceived ease of use, and user acceptance of information technology," by F.D. Davis, 1989, *MIS Quarterly*, *13*(3).

TAM predicts that when a potential adopter is considering a new technology (or *innovation* in IDT terminology), the adopter forms two beliefs regarding the technology: *perceived usefulness* (PU) and *perceived ease-of-use* (PEU). As is posited in IDT, these perceptions are formed by external and internal influences at the individual and social system levels. From these perceptions, individual forms an *attitude toward using* the technology and ultimately an intention to use, or *behavioral intention* (BI), as the key determinate to actual use, or *use behavior* (UB). Additional factors in the model are external to the individual decision and are posited as being moderators or antecedents of beliefs. These factors include concepts such as the characteristics of the technology, individual attributes, environment of usage, etc.

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Over nearly three decades, research on the original TAM (Davis, 1989) has evolved the model to include greater depth and breadth of constructs predicting intention and actual use. The research involved with this evolution has incorporated external influences, antecedents, and greater understanding of relationships in the decisions processes. This evolution has produced what has been referred to as TAM-2 (Venkatesh & Davis, 2000; i.e., addition of social influence) and TAM-3 (Venkatesh & Bala, 2008; i.e., expansion of antecedents and anchoring), and ultimately evolved to the UTAUT. Through the evolution of the model, researchers found BI was a near universal predictor of UB and that attitudes toward use was neither empirically or theoretically necessary in the model.

Although TAM has been established as a "reliable and parsimonious theory" (E. W. Christensen, 2013, p. 829), parsimony, or simplicity, and prescriptive usage is often cited as a critiques of the model (Venkatesh, Davis, & Morris, 2007). A common theme of criticism focuses on the simplicity of the model (E. W. Christensen, 2013). The model includes only two belief constructs that determine intention and ultimately actual use. Critics argue that individual behavior is constrained by contexts of adoption outside the individual decisions processes — this critique relates to the social system view of adoption in IDT. TAM has also been criticized for its focus on descriptive micro-level (the individual) view of adoption, with little value for prescriptive strategies (Venkatesh et al., 2007). Combined, these two criticisms illustrate a limitation of findings to strategies on improving technology adoption at a system level above the individual due to larger constructs of organization and social system variables. While the intention of TAM is to predict individual adoption, as opposed to adoptions in series or to reach a certain level of adoption across a system, E. W. Christensen (2013) highlights,

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> The consequence is that learning and social influence remain relegated to preadoption beliefs alone. The theoretical criticism [is] that all technology use is adopted in a social context and so too must the prescriptive strategies leading to more successful adoption. (p. 831)

TAM-3 and UTAUT work to address these criticisms. However, the key concept related to TAM and the criticisms is that a careful balance of managing perceived usefulness and ease of use in implementation strategies is needed to better ensure adoption and intended use; which relates to the function of change agents and support. Throughout this review, TAM-2 and TAM-3 are simply be referred to as TAM, given that many research studies use only portions of the evolved models, thus limiting the distinction between partial models (e.g., a subset of TAM-3 can easily appear as TAM-2 or an extended TAM can predate the formal development of TAM-2).

General Research Perspectives. Davis, Bagozzi, and Warshaw (1992) conducted two studies involving full-time and part-time MBA students' ($N_{study\text{-}1} = 200$; $N_{study\text{-}2} = 40$) perceived usefulness and enjoyment of two software innovations. In the studies, students had no, little, or moderate experience with computers (77% and 83%), personal computers (72% and 83%), or the software (76% and no experience, respectively). A survey of Likert-type responses, of various point values, was delivered to students focusing on the constructs of enjoyment, perceived ease of use, perceived output quality, usage intentions, and usage. Survey items were adapted from previous research by the authors. Validity and reliability analysis was conducted in each study with both studies individually. Reliability was deemed acceptable with Cronbach $\alpha \geq .80$ for all factors, except for output quality in the two studies (.78 and .69, respectively).

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Results in Davis et al. (1992) confirmed the long-held hypothesis that BI was a significant determinant of UB in study 1 ($t(198) = 5.96$, $R^2 = .40$, $p < .001$; UB was not measured in study 2). Additionally, in both studies, PU ($t(197) = 13.28$, $p < .001$, $\beta = .68$; $t(77) = 12.09$, $p < .001$, $\beta = .79$) and enjoyment ($t(197) = 3.08$, $p < .01$, $\beta = .16$; $t(77) = 2.62$, $p < .05$, $\beta = .15$) had significant effects on BI ($R^2 = .56$ and $R^2 = .74$, respectfully). The researchers concluded that potential adopters' intention to use an innovation was influenced primarily by perceptions of how useful the innovation will be to improving job performance and to a lesser extent a degree of enjoyment derived from using the innovation. However, Davis et al. (1992) conceded that their ease of use construct may have been tapping into ease of learning, and recommended future research explore the delineation between ease of use and learning.

Venkatesh and Davis (2000) conducted four longitudinal field studies involving a range of industries, contexts, and types of innovations introduced. Venkatesh and Davis included a new construct in the TAM model regarding innovation adoption as voluntary, mandatory, or explicit — hypothesizing that perceived voluntariness will moderate subjective norm over actual voluntariness. Questionnaires were administered to corporate employee participants in the four studies ($N = 156$, $N_{study1} = 38$, $N_{study2} = 39$, $N_{study3} = 43$, and $N_{study4} = 36$) after initial training and one, three and five months after implementation. The questionnaire consisted of 26 items previously validated by the researchers; with confirmed reliability at or exceeding $\alpha = .80$ for all constructs and time periods of administration. The first administration after initial training was administered online; while remaining administrations were conducted by mail.

In all studies, both voluntary and mandatory settings, Venkatesh and Davis (2000) found results consistent with prior research indicating PU was a significant determinate of BI, with PEU as a significant secondary determinate. The effect of subjective norm on intention, or

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compliance toward mandatory-ness, was significant in mandatory-set studies; while not significant in voluntary-set studies. Of interest is that the subjective norm effect in mandatory studies weakened to non-significance by the fourth administration (at five months) — indicating that the mandatory effect on compliance was weakened after confirmation of usefulness and ease of use.

Educational Technology Research Perspectives. TAM has been the framework for a number of studies in acceptance of technologies in education over the past decade. The three-study review which follows provides essential exemplars of TAM in education research, for additional TAM-based educational research exemplars, see Teo (2011b). An investigation of faculty acceptance of *online education*, a generalized technology innovation, using TAM was conducted by Gibson, Harris, and Colaric (2008) as survey-based research. Surveys were provided to faculty in a large regional university's colleges of business and education. A 46.8% response rate resulted in 110 respondents, comprised of 52% men, 45% women, and 3% undisclosed. The average age of respondents was 48 years. An average number of years teaching was 12.3 years, with 2.1 years teaching online. Seventy-seven percent held a terminal degree. Nineteen percent of respondents were full professors, 19% associate professors, 33% assistant professors, 22% lecturers, and 6% some other faculty status or rank.

The Gibson et al. (2008) survey items were based on previous research by Davis et al. (1989), modified specifically to reflect online education from a faculty perspective. For example, perceived usefulness was not only evaluated by perceived usefulness to the faculty member (e.g., "compatible with how I teach my courses") but also the faculty members perceived usefulness of the technology to the student (e.g., "effective way for students to learn") (Gibson et al., 2008, p. 357). Internal validity measures reported by the researchers indicated an

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acceptable level for perceived usefulness (α = .859) and somewhat lower for perceived ease of use (α = .594); although the lower Cronbach α was not directly questioned in the study.

Gibson et al. (2008) performed separate multiple regressions for the predicted moderating variables on perceived usefulness and perceived ease of use. The researchers observed the moderating variables on PU explained 58.7% of variance, $F(5, 104) = 29.517$, $p < .01$. Additionally, the moderating variables on PEU explained 33.9% of variance, $F(4, 105) = 14.986$, $p < .01$. Moderating variables on BI were also analyzed using multiple linear regression. The researchers observed overall model fit significance ($R^2 = .602$, $F(4, 105) = 16.835$, $p <.01$). However, when the researchers contrasted PU and PEU related variable influences on the overall model, it was determined that PEU did not predict significantly "over and above" PU ($\Delta R^2 = .016$, $F(4, 100) = 0.993$, $p = .415$). While addressed by the researchers, this lack of significance may have been partially due to the lower internal validity of the PEU items construct.

Relative to the overall number of studies published, research in joint TAM and IDT models is more prevalent in education research than information systems research. Two such studies are those of Lin and Chen (2012) and Y. H. Lee, Hsieh, and Hsu (2011). Len and Chen proposed a joint model to investigate the attributes of innovations in course management systems. This proposal focused on an innovation's attributes as perceived by faculty (relating to IDT) and perceived quality increases in pedagogy as a moderating variable for PEU and PU. Additionally, the researchers included evaluation of functions as an overall mediating factor in the acceptance of technology — likening to experiences of social system communications in IDT. Len and Chen's proposed model was limited in terms of unifying IDT and TAM constructs and the researchers' lack of empirical evidence in their proposed model contradicts earlier research by Lee, Hsieh, and Hsu.

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Y. H. Lee et al. (2011) integrated IDT innovation attributes of compatibility, complexity, relative advantage, trialability, and observability with the TAM in an investigation of employees' use of course management systems. Similar to the proposed research of Len and Chen, Lee, Hsieh, and Hsu, hypothesized innovation attributes would moderate perceived ease of use and perceived usefulness, as well as behavioral intent. Lee, Hsieh, and Hsu tested hypotheses through survey-based research involving 566 employees in 15 corporations in Taiwan. The sample included roughly equal male and female participants with over 97% having earned a college degree. The distribution of participant age was highly skewed toward younger employees (58% < 29 years, 28% 30-39 years, and 14% > 40 years) — younger employees are more prone to accepting technology. The survey instrument was constructed from previous TAM (Davis et al., 1989; Venkatesh & Davis, 2000) and IDT (G. C. Moore & Benbasat, 1991) instruments.

Y. H. Lee et al. (2011) performed structural equation modeling on respondent data to test the fit of the research model. In addition to confirming long-established relationships in the TAM (e.g., PEU→PU, and PU→BI), several IDT related constructs were detected as significant influences as well. Compatibility (CPL) and relative advantage (ADV) was found to influence PU ($\beta = 0.33$, $p <.001$ and $\beta = 0.25$, $p > .001$, respectively). Secondary influences were detected on PU as CPL ($\beta = 0.20$, $p <.01$) and TRL ($\beta = -0.099$, $p <0.01$). However, CPL and TRL were stronger influences of PEU ($\beta = -0.64$, $p < .001$ and $\beta = 0.09$, $p < .001$) in addition to the influence of ADV ($\beta = 0.21$, $p < .001$). Overall, the five IDT constructs and PEU explained 42% of the variance in PU. A stronger model was observed for PEU, in that the five IDT constructs explained 64% of the variance. BI variance was explained by CPA, CPL, ADV, Observability (OB), TRL, and PU ($R^2 = .51$). In addition to the explicit findings of Lee, Hsieh, and Hsu,

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regarding the influences of CPA, CPL, ADV, OB, and TRL on PU, PEOU, and BI, the study successfully demonstrated that IDT constructs could further refine the TAM model's explanatory power.

Summary. TAM has been the most highly cited and researched acceptance model within the technology fields, although it has also been employed to research acceptance of processes and methods. TAM has been both lauded and criticized for its simplicity and parsimony. While TAM has evolved over time with the minor inclusion of new extant constructs, the core constructs and relationships have remained relatively unchanged and exhibited close parallels to IDT. A core difference between IDT and TAM and other acceptance models is the primary unit of study – in that IDT relates to social groups and acceptance is that of individual adoption. However, IDT and TAM have been successfully integrated to explain implications for group diffusion through individual adoption. TAM has remained a current research model even as new and confirmed acceptance models have grown out of TAM, highlighting the model's relative usefulness and relevance in research.

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) furthered research in technology acceptance models as by unifying prior theories in acceptance. As with TAM and similar acceptance models, the UTAUT model identified factors in acceptance of technology measured by behavioral intent to use and actual usage. The UTAUT model grouped determinants of acceptance as performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). The model posits four main effects of the determinants and four moderating factors: gender (GDR), age (AGE), experience (EXP), and voluntariness of usage (VOL). The predictive ability

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of UTAUT was observed up to 70%, a significant improvement over the ability of TAM at 30-40% (Oye et al., 2014).

In development of the UTAUT model, Venkatesh et al. (2003) compared against eight existing acceptance models using longitudinal with-in subjects data from four organizations, at three points in time similar to Davis et al (1989) outlined in TAM (i.e., post-training, one month after training, and three months after). These comparisons provided a baseline for determining the overall efficiency, validity, and reliability of UTAUT in contrast to previously researched models. Through a review of the eight existing acceptance models — Theory of Reasoned Action (TRA), TAM, Motivation Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), IDT, and Social Cognitive Theory (SCT) — the researchers identified the models compromised a total of 32 determinant core constructs (Venkatesh et al., 2003). Venkatesh et al. (2003) also identified four moderating variables common in the previous literature on the existing models as GDR, AGE, EXP, and VOL.

The survey instrument was created from previously validated instruments. TRA related items were adapted from (Davis et al., 1989). TAM related scales were adapted from Davis (1989); Davis et al. (1989); and Venkatesh and Davis (2000). IDT related scales were adapted from G. C. Moore and Benbasat (1991). Additional scales were adapted for MM, TPB, MPCU, and SCT (see, Venkatesh et al., 2003). BI was measured using a scale adapted from Davis et al. (1989). UB was measured through system logs for the technologies under study. All constructs were measured using seven-point Likert-type questions.

Partial least squares regression was used to test all eight models at each of the three points in time for two datasets. The hundreds of results of variance explained and coefficients

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for this study are too substantial to list here, however, Venkatesh et al. (2003) highlighted several key findings in the model comparisons. First, all eight models could explain variance in BI with a range of 17% to 42%. Voluntariness or mandatory-ness of technology use was a key difference between studies. In dataset 2, a mandatory use setting, SI constructs were significant, however in set 1, a voluntary use setting, SI was not significant. As with previous studies, experience with the technology influenced intention over time (i.e., significance diminished on repeated measures).

To formulate the unified theory, Venkatesh et al. (2003) examined commonalities among the models' significant determinants of BI. Through examination, the researchers identified seven constructs, however, theorized that only four of those seven functions as significant direct determinants of behavioral intent and usage: PE, EE, SI, and FC (Venkatesh et al., 2003). The remaining three constructs — attitude toward using technology, self-efficacy, and anxiety — were theorized as not directly determining intention.

The findings of Venkatesh et al. (2003) formed the UTAUT model, see Figure 7. By pooling data from the two datasets, the model explained 76% of the variance of BI through partial least squares regression and 77% through hierarchical regression. The direct influence of PE explained 53% of the variance; while the direct and indirect effects of PE·GDR·AGE explained 55%. of BI. EE·GDR·AGE·EXP negatively influenced BI by 27%. Lastly, SI·GDR·AGE·VOL·EXP also negatively influenced BI by 28%. PE was a stronger influence for men and younger users, implying that those potential adopters were more likely to intend to use a technology if they believed the technology would strongly enhance their job performance. EE was stronger for women and older users, implying that those potential adopters favored technologies that were perceived as less complex to implement. FC was stronger for older

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workers, implying that older workers were more likely to adopt if they believed supports were in place to support implementation.

As was identified previously with TAM, there have been critics of UTAUT in terms of shortcomings and conceptual gaps. Bagozzi (2007) documented a number of critical shortcomings in UTAUT, all of which effect TAM as well. The number of independent variables inherent in UTAUT reached 41 when direct, indirect, and multiplicative factors are considered. Additionally, to predict behavior, at least 8 additional variables are introduced (Bagozzi, 2007).

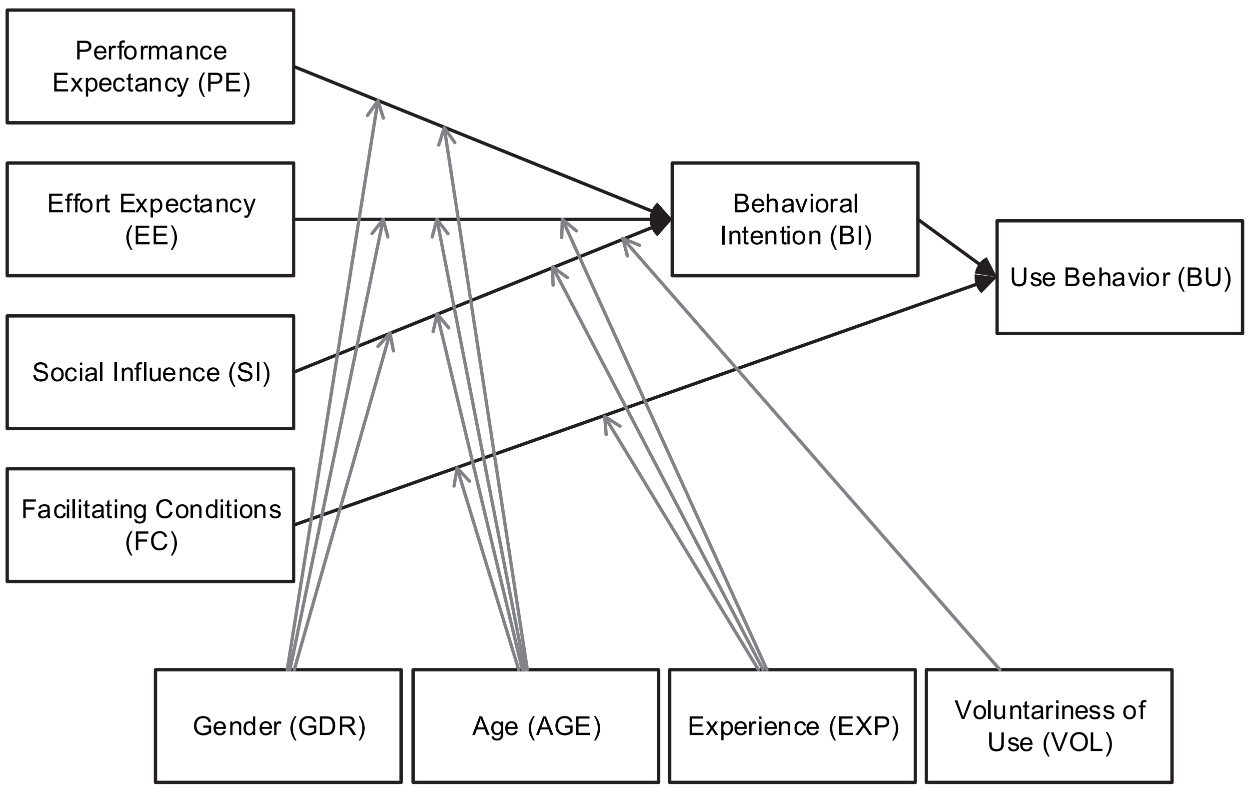

Figure 7. Unified Theory of Acceptance and Use of Technology Model. From "User acceptance of information technology: Toward a unified view," by V. Venkatesh, M.G. Morris, G. B. Davis, and F.D. Davis, 2003, *MIS Quarterly*, *27*(3), p. 447.

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Bagozzi (2007) also identified a general neglect of "group, social, and cultural aspects of decision making" as a shortcoming (p. 245). Bagozzi argued that decisions in technology acceptance are often approached collaboratively or with a focus on how the technology or adoption itself fits in with or affect the group, as opposed to an individualistic viewpoint. Particularly, Bagozzi (2007) identified *agency* as a critically omitted construct, in that a "central problem of agency is to understand the difference between events happening in [the adopter] or to [the adopter] " (p. 250).

van Raaij and Schepers (2006) also touched on the problematic constructs of facilitating conditions and social influence. Their concern was that facilitating conditions integrates perceived behavioral control, facilitating conditions, and compatibility, creating a wide variety of psychometric constructs from technology fit to work style to the availability of resources and assistance. Similarly, social influence integrates subjective norm, social factors, and image, combining induvial perception of what other people think about the adopter using the technology, other people being supportive of the adopter using the technology, and perceptions of whether other people using the technology are of a higher social status. van Raaij and Schepers (2006) argued a difficulty in understanding how these disparate items could reflect the same latent constructs.

A critical gap, identified by Bagozzi (2007), involved the UTAUT model linkage assumptions regarding BI→UB. He argued that the linkage identified was the "most uncritical accepted assumption in social science research (Bagozzi, 2007, p. 245)". In arguing this notion, he reflected on goal setting, striving and attainment as more crucial of linkages to actual use than behavioral intent.

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Yet another concern of Bagozzi (2007) was that of additive or multiplicative effects in the summative or overall model, as belief or perception based cannot be assumed to be equally scaled and thus multiplicity introduced measurement error. Additionally, he alludes to the affective nature of the belief or perception scales. Emotions inherent in intrinsic motivation, joy, or anxiety, for examples, are not accurately measured on a self-responded single instance Likert-type scale.

Research Perspectives. Dwivedi, Rana, Chen, and Williams (2011) meta-analysis of studies which cited the UTAUT originating article (Venkatesh et al., 2003) identified 870 articles in the *Web of Science* database, between 2004 and 2010, with all sources of articles originating from information systems and computer science related journals. Of these, 450 were downloadable for further analysis. Forty-three fully utilized the UTAUT model as the research model. The remaining 407 articles cited UTAUT and only made use of parts of the model and constructs. Mythologies used in the 43 articles were then further analyzed finding 27 which employed quantitative research methods and the remaining articles employing qualitative or alternative methods.

The researchers focus of the meta-analysis was in the areas of external theory integration, variables external to the UTAUT model, the reliability of the constructs instrumentation, construct correlations, and limitations of research analyzed (Dwivedi et al., 2011). TAM was found to be the most commonly integrated model with UTAUT. However, integration of IDT, SCT, and Task Technology Fit (TTF) were also identified as integrated theories. Over half of the studies analyzed used variables external to the UTAUT model, with the remaining using the UTAUT model in original form. The most common external variables identified include

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attitude, anxiety, trust, self-efficacy, PEOU, PU, perceived risk, and credibility (Dwivedi et al., 2011).

Of the articles reporting reliability of the UTAUT constructs, all indicate acceptable Cronbach's α (i.e., greater than .70; Nunnaly, 1978), although several report reliabilities at a concerningly high level exceeding .90. Dwivedi et al. (2011) calculated the average reliability among the six UTAUT constructs in the articles as: PE, $n = 17$, $\alpha = 0.798$; EE, $n = 15$, $\alpha = 0.870$; SI, $n = 12$, $\alpha = 0.811$; FC, $n = 13$, $\alpha = 0.747$; BI, $n = 14$, $\alpha = 0.895$; and UB, $n = 4$, $\alpha = 0.870$. This summarization of previously obtained reliability provides evidence of the overall reliability that can be expected from the UTAUT instrumentation constructs.

Computing a combined correlation of constructs of all the applicable studies, Dwivedi et al. (2011) used individual article reported construct β-values and sample sizes. Strong correlations were identified as PE→BI and BI→UB ($\beta = .343$, $z = 21.699$, $p < .001$, and $\beta = .405$, $z = 4.097$, $p < .001$, respectively). Statistically significant correlations were also detected in all remaining construct relationships of the UTAUT model: EE→BI ($\beta = .140$, $z = 2.201$, $p = .028$), SI→BI ($\beta = .231$, $z = 4.945$, $p < .001$), FC→UB ($\beta = .165$, $z = 7.103$, $p < .001$). These findings are consistent with the original UTAUT model research (Dwivedi et al., 2011).

In a summary of reported limitations in the analyzed articles, Dwivedi et al. (2011) categorized the limitations into nine themes. Of the themes presented, several are not applicable to the current study (e.g., self-reported usage, single information system, student samples), as the study focuses on overall technology innovations, faculty, and BI as the intended outcomes of a change agent, as previously described. Of the remaining limitation themes directly impactful of the current study, 54.1% of the analyzed studies reported limitations that Dwivedi et al. (2011) categorized as "other". These included small sample sizes, self-selection bias, little to no cultural

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consideration, or short exposure times to adopt the technology. Single subject limitations (i.e., "only one community, organization, culture, or country") comprised 32.4% of the studies (Dwivedi et al., 2011, p. 165). While cross-sectional studies comprised 13.5%, where data were collected at a single point in time. The observed limitations and common correlation findings are reflective of what has been identified in previous acceptance research.

As was highlighted by the Dwivedi et al. (2011) meta-analysis, many UTAUT studies integrate or extend the UTAUT model beyond the original research. These extensions can impact the overall model findings beyond the findings consistent with the original model. One such example is Venkatesh, Thong, and Xu (2012). The researchers extended the UTAUT model with new constructs of *hedonic motivation, price value,* and *habit*, while removing the *voluntariness* construct. Hedonic motivation was conceptualized as perceived enjoyment or pleasure. Price value was conceptualized as the cognitive tradeoff between the price of adoption versus the perceived benefits. Habit was conceptualized as prior technology adoptions influencing future adoptions. While not stated by the researchers, each of these newly added constructs draw a close resemblance to IDT concepts.

Venkatesh et al. (2012) researched the extended model, which the researchers referred to as UTAUT2, in the context of consumer acceptance of mobile internet technology in Hong Kong. Participants were recruited by web banner advertising on a governmental services web portal and entered in various prize drawings. Respondents were surveyed in a two-stage process: at time of sign-up (n = 4,127) and four months later (n = 2220). The researchers excluded data from respondents with no prior mobile internet experience (a condition of the *habit* construct), resulting in a final sample of N = 1512.

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Through a PLS-SEM analysis, Venkatesh et al. (2012) found differences between the original UTAUT model predictions and the UTAUT2 model with new constructs. In the original model, FC only directly influenced UB, with no interaction with BI. In UTAUT2, FC was found to still be a direct effect on UB ($\beta = .15$, $p < .05$), however FC ($\beta = .17$, $p < .001$) and FC·GDR·AGE ($\beta = .22$, $p < .001$) were now found to be significant direct and indirect effects on BI. These findings reflect the contextual and model operationalized specific generalizability of the UTAUT model in the original form.

Educational Technology Research Perspectives. Numerous studies have researched educational technology using the UTAUT model (see, Teo, 2011b). To supplement the extensive foundational research presented, this review of education-centered research with the UTAUT model will focus on a recent study in educational technology adoptions in the context of educator acceptance. Liu, Lin, Zhang, and Zheng (2017) conducted research on Chinese language educators use of educational technology from the perspective of internal and external factors affecting pedagogy. Similar to the ISP standards previously reviewed, Liu et al. (2017) highlighted the context of teacher preparation standards as indicating that "teachers should understand that technology support the teaching and learning of language and culture and provides tools, strategies and practices that motivate student interest in increase performance" (p. 2). The researchers' focus reflects closely on the current study intent to clarify the factors that influence adoption of educational technology. In their focus, Liu et al. (2017) identified FC as the primary influence on BI and thus the research primarily addressed this construct.

Liu et al. (2017) utilized a modified instrument integrating TAM and UTAUT constructs and administered it to 47 K-12 teachers enrolled in a university certification program in the Midwestern United States. The participants were mostly female ($n = 39$) and between the ages

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of 21 and 25 (66%). In addition to demographic information, the FC, PU, PEU, SN, and technology/pedagogy behavior were surveyed, with observed reliability at acceptable levels (α = .86, α = .91, α = .83, α = .91, and α = .89, respectively).

Through a SEM analysis of these data, Liu et al. (2017) detected significant direct effects on behavior. FC was observed as a positive influence on behavior (β = .28, $p < .05$). PU and SN were also observed as positive influences on behavior (β = .32, $p < .05$, and β = .17, $p < .05$, respectively). PEU was not observed as a significant influence on behavior (β =.15, $p = .27$). Together the four variables' direct effect, explained 44% of variance on behavior. Liu et al. (2017) also indicated FC functioned as a mediating factor on PEU and SN (β = .56, $p < .001$, and β = .48, $p = .001$, respectively), although FC was not a significant mediator on PU (β = .23, $p = .09$). These observations generally support the findings of Venkatesh et al. (2012), whereas FC was observed as significant effects on BI. In discussion, Liu et al. (2017) highlight the impact of findings on educators, policy makers, and administration. The researchers' recommendations included to improve facilitating conditions when promoting implementation of educational technologies — or specifically, "easy access to technical support, abundant resources, and *technology related pedagogical training* [emphasis added]" (Liu et al., 2017, p. 15).

Summary. UTAUT has extended research in technology acceptance to include richer explanatory power and depth of constructs. Through a thorough analysis of previous acceptance models, UTAUT has been defined with the strongest constructs of each model, results in a model with predictive ability reaching 70%. However, this predictive capability has been achieved through a high number of variables in the model – a significant critique of its usefulness and generalizability. Additional critiques of the UTAUT model call into question construct validity of facilitating conditions and social influence. Further research should factor in these critiques.

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Overall, the UTAUT model has contributed to researchers' and practitioners' ability to predict and account for potential adopters' perceptions and needs.

Conclusions

This chapter critically reviewed the literature concerning change agency in the roles of ISP in the context of technology diffusion in higher education. The role of ISP was explored in explicit and implicit expectations regarding the professions' role in change agency. Specifically, the purpose of this review was to present an examination concerning theoretical models employed to investigate the influence of key constructs in the educational technology use-decision process likely used by faculty. Research is needed to produce information to guide faculty involved with the preparation of ISP in roles relating to change agency, administration in identifying the conditions in which ISP are capable of contributing to change efforts, and to further refinement of acceptance models to delineate "facilitating conditions" which may include the activities of change agents. The literature review provided a foundation for development of the methodology for the current study. The design conceptual framework for the study is presented in Chapter three.

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CHAPTER THREE – METHODOLOGY

As a result of the technology-rich higher education academic environment, an important role of ISP is that of change agent. Surveys of the profession have indicated considerable conflict and barriers to success in areas related to change agency. While significant research on change agency in diffusion of innovations exists, no published research has focused on change agency in the context of ISP. Secondly, little research exists on the role of change agents in the process of individual adoption of technology and no research on the role of ISP change agency on individual adoption. The study investigated the role ISP play in change agency in diffusing educational technology innovations and what role this change agency plays in individual acceptance decisions. This chapter provides an overview of the research design, instrumentation, procedures, population, and analysis and reporting methods.

Conceptual Framework

Predicting the influence of ISP change agency and functional support efforts on behavioral intentions of faculty to adopt an educational technology would be beneficial to faculty, administration, and ISP and contribute to the UTAUT model body of research. In the context of IDT, change agency impacts potential innovation adopters' beliefs of outcome relevancy, adoption impact on activities, and how well an innovation fits within a social system (Rogers, 2003). Each of these areas are conceptually related to the predictor variables in UTAUT. The methods and communications of a change agent will likely influence a faculty member's perception of effort required, performance outcomes likely to be expected, and function as a sharing of information regarding prior adoptions by other faculty within the social system, in relations to facilitating support and influence.

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An ISPs role as functional support will be less likely to directly influence adopter's performance expectancy or social influence perceptions, as the functional-support ISP will enter the model post adoption decision. However, an adopter's previous experience with ISP in the support role will likely influence future adoption based on expected outcomes of the support provided to the faculty and peers. Therefore, in the current study, the ISP role of functional support is not expected to influence an adopter's perception of social influence or performance expectancy.

Prior studies reviewed have identified adopter-level factors, such as age, voluntariness, experience with similar technologies, and other demographics, significantly moderate behavioral intent to adopt a technology. In the current study, similar factors will be identified that relate closely with faculty demographics in the context of teaching and technology. Two factors chosen for this current study, age and gender, relate directly to both a personal characteristic and an interpersonal characteristic – e.g., dynamics of heterophilous and homophilous groups and change agent interaction. A third factor relates to their prior knowledge and experience as an educator, years of teaching experience; which likely contributes to decisions and optics regarding technologies and outcomes which may be expected. While age and years of teaching experience are similar, the two factors may exhibit differently depending on the demographic, e.g., those who entered teaching later in life versus those who entered teaching directly following graduate studies.

Lastly, while the predominance of prior research in the UTAUT model has indicated an insignificant relationship between FC and BI (Dwivedi et al., 2011), the current study will confirm these findings in the context of the addition of CA and FS as predictors and delineations of SI and FC. Similarly, Venkatesh et al. (2012) identified significant relationships of FC and BI

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both directly and as moderated effects of demographic factors. Through limiting the scope of the UTAUT model and inclusion of additional constructs to delimit SI and FC, the conceptual framework, illustrated in Figure 8, guided the current study.

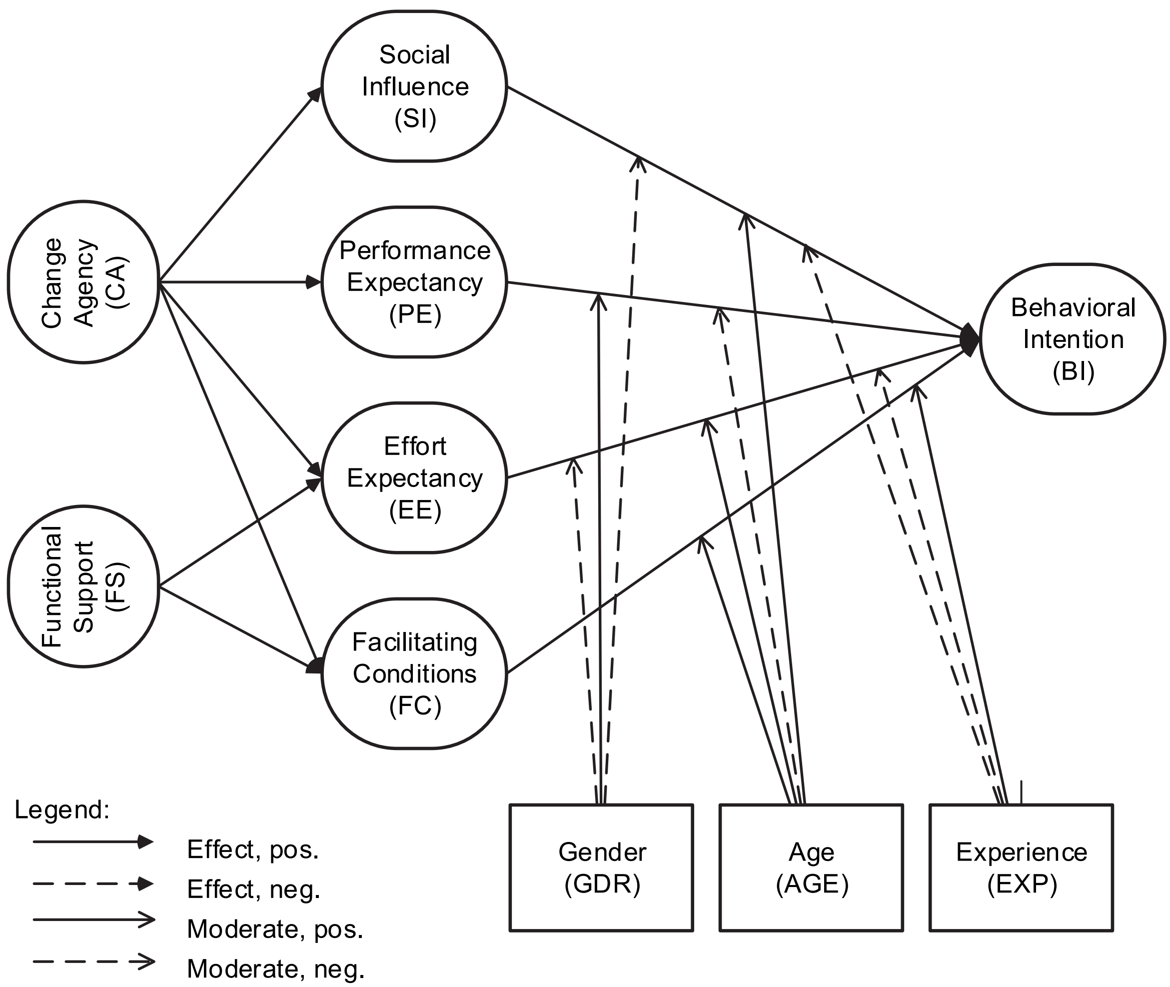

Figure 8. Research Conceptual Framework.

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Definitions

The following terms and definitions are used within this study to frame constructs presented.

Behavioral Intent (BI) is the expressed view of a potential user on adoption of the technology in a specific time period. See *Appendix A* for BI construct items and research source(s). Greater scores indicate a greater level of behavioral intent to adopt educational technologies.

Change Agency (CA) are the activities facilitating change in the context of technology adoption (Beabout & Carr-Chellman, 2008). While change agency can refer to an organization entity, for the purpose of this study, the term is limited to an individual's actions. This construct has developed in response to van Raaij and Schepers (2006) concern regarding delimitation of the SI construct. See *Appendix A* for CA construct items and research source(s). Greater scores indicate a greater change agent involvement in the adoption process.

Educational Technologies are technologies limited to the scope of academic use with pedagogical implications by faculty to support face-to-face, hybrid, and online courses. Although potentially used in instruction, this definition does not include generalized technologies used in the day-to-day activities of faculty (e.g., spreadsheets, statistical packages, word processors).

Effort Expectancy (EE) is the degree of perceived ease of using the technology (Venkatesh et al., 2003). Effort expectancy is directly related to IDT ease of use construct, which reflects the degree of difficulty in using the innovation for a given task (G. C. Moore & Benbasat, 1991). See *Appendix A* for EE construct items and research source(s). Greater scores indicate that a respondent expects a greater level of effort required to implement the technology.

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Experience (EXP) refers to the number of years that a faculty member has experience in the physical or virtual classroom. This construct assumes years of experience relates to understanding of change needed for student success and pedagogy improvements. Experience is measured by a single numeric response on the instrument demographics section, see *Appendix A*. Experience was measured as a continuous variable.

Facilitating Conditions (FC) is the degree which a potential user believes that the organization and technology infrastructure exists to support his or her use of the technology (Venkatesh et al., 2003). Venkatesh et al. (2003) relate this to IDT *compatibility* construct, or the degree to which an innovation is perceived as consistent with the existing values, needs, and experience of the adopters. However, for this study, FC was limited to facilitations beyond the role of an ISP (i.e., does not include change agency or functional support). See *Appendix A* for FC construct items and research source(s). Greater scores indicate that a respondent expects to receive a greater level of facilitating support from peers and leadership while implementing the technology.

Functional Support (FS) includes technical and pedagogical support by ISP to implement and use educational technologies in the classroom. This construct has developed from the concerns of van Raaij and Schepers (2006) to further delimit the FC construct. See *Appendix A* for FS construct items and research source(s). Greater scores indicate that a respondent expects to receive a greater level of functional/technical support while implementing the technology.

Instructional Support Professional (ISP) includes professionals traditionally tasked with supporting faculty and administration efforts in educational technologies.

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Performance Expectancy (PE) is the degree which an individual perceives use of a technology will help him or her enhance job performance. (Davis et al., 1989; Venkatesh et al., 2003). Performance expectancy is directly related to IDT *relative advantage* construct, which reflects the degree to which an innovation is perceived as better at a task than a previous innovation (G. C. Moore & Benbasat, 1991). See *Appendix A* for PE construct items and research source(s). Greater scores indicate that a respondent expects to achieve greater job-related performance as a result of adopting the educational technology.

Social Influence (SI) is the degree to which a potential user perceives other important individuals in the social system as believing the potential adopter should use the new technology (Venkatesh et al., 2003). Social influence is directly related to IDT *image* construct, which reflects the degree to which a potential adopter perceives an enhanced social status as a result of adopting an innovation (G. C. Moore & Benbasat, 1991). See *Appendix A* for SI construct items and research source(s). Greater scores indicate that a respondent believes the adoption of educational technology is influential on their social status.

Study Design

The study design was a quantitative, non-experimental correlational survey as cross-sectional research to examine interrelated dependency relationships in the conceptual model, using an extended approach to the UTAUT model. The extension of UTAUT not only served to investigate the influence of ISP change agency (CA) and functional support (FS) roles, it also begins to address concerns of van Raaij and Schepers (2006). van Raaij and Schepers (2006) were critical of the UTAUT models FC and SI constructs as being overly broad and potentially flawed in construct validity. By delineating CA from SI and FS from FC, this researcher believed the confounding issue would be lessened. While extending the constructs in exogenous

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variables, the current model limits the dependent variable analysis to BI. BI has been well established as the primary influence on UB, therefore, the additional analyses in UB would not add to the body of UTAUT research or be impactful on the ISP practice. Previous studies have successfully extended the UTAUT model for a given context (see, Chang, 2012; Dwivedi et al., 2011; Parameswaran, Kishore, & Li, 2015). Likewise, studies have limited the outcome variable when applicable to the context (see, Dwivedi et al., 2011; Teo, 2011a).

Inherent in the research problems stated in Chapter 1 and those that evolved in Chapter 2, there exists three underlying questions that guide the current research. These questions relate to 1) whether change agents provide value in the decision process, 2) how change agency contributes to the overall acceptance of educational technology in higher education, and 3) the effect of including change agency to acceptance models. Therefore, the research focused on the following research questions (RQ) and hypotheses (H) to guide the study.

RQ1: After delineating the role of ISP as both a change agent and functional support, what effect does each role contribute to overall behavioral intent of faculty in adopting educational technologies in their courses?

H1a. CA has a positive effect on BI.

H1b. FS has a positive effect on BI.

RQ2: What mediating effects does ISP change agency and functional support have on faculty perceptions in acceptance processes?

H2a. The SI, PE, EE, and FC mediates a positive effect of CA on BI.

H2b. The EE and FC mediates a positive effect of FS on BI.

RQ3: How do the faculty characteristics of GDR, AGE, and EXP moderate indirect effects of CA and FS on BI?

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H3a. GDR moderates the indirect effects of CA and FS on BI.

H3b. AGE moderates the indirect effects of CA and FS on BI.

H3c. EXP moderates the indirect effects of CA and FS on BI.

Latent variables selected for this model have been identified in the hypotheses. Specifically, endogenous variables, or variables that act as a dependent variable in one or more SEM equations, included BI, PE, EE, SI, and FC. Exogenous variables included CA, FS, GDR, AGE, and EXP. The dependent variable in the overall model was that of BI.

Instrumentation

In keeping with the predominance of research on diffusion and acceptance that precedes this study, a survey-based approach was employed to test the theoretical model. The structured questionnaire was developed consisting of previously validated research constructs and items (Venkatesh et al., 2003) with the addition of two change agency and functional support constructs derived from IDT related studies (Cronin & Taylor, 1992; G. C. Moore & Benbasat, 1991; Perez, Popadiuk, & Cesar, 2017). *Appendix A* lists demographic and construct items from previous literature, with revised wording that reflected the focus of the current research (i.e., "educational technology").

While previous UTAUT research has predominately utilized a seven-point Likert-type scale, with response choices ranging from "strongly disagree" to "strongly agree", an additional modification was made to that of five-point scale based on guidance and prior research on psychometric properties of the scales along with expectation of substantial participant completion of the instrument on mobile devices (Krosnick & Presser, 2010). Five-point Likert-type scales have been shown to increase response rates and quality while reducing respondents' cognitive load (Babakus & Mangold, 1992; Buttle, 1996; Devlin, Dong, & Brown, 1993; Hayes,

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1998). Researchers have also reported higher reliabilities for five-point scales (Jenkins & Taber, 1977; Lissitz & Green, 1975; McKelvie, 1978).

A carefully selected survey flow was designed to elicit responses quickly and efficiently, as illustrated in *Appendix B*. The survey was constructed of five sections, excluding a consent agreement. The first section included basic demographic information about the participant. Demographic information was collected for both participant evaluation and inclusion in the model analysis where applicable (i.e., gender, age, and experience). Four demographic questions were presented in the first section of the survey, as listed in *Appendix A*. Indirect capture of institution-level characteristics was gathered through unique institution identifier keys in the survey links, which alleviated the need for respondents to determine institutional control and type which are predetermined based on accreditor data.

Section two included a single question related to the participants prior educational technology use. The participant was allowed to select multiple technologies from a number of common technologies used in face-to-face, online, and hybrid courses. In addition, participants were allowed enter a technology not listed through open response. These open responses were reviewed by the researcher to determine if the entries create a distinct new technology or are appropriately aligned with defined technologies.

A third section began by asking the participant if they had interacted with an ISP to develop or refine a course, along with providing participants a definition of what types of titles ISP hold. An affirmative response resulted in the participant receiving the new CA and FS items in groups of three-item matrix-type questions. The fourth and most lengthy section included the standard UTAUT instrument items as four-item matrix-type questions.

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A final section provided participants an opportunity to withdraw from the study or continue. Withdrawal removed the participants responses from the data. Continuance directed participants to the final submission screen and information regarding how to opt-in to a random drawing, a benefit described in the Protection of Human Subjects.

As outlined in Data Analysis, the research instrument constructs were verified for internal consistency through evaluation of Cronbach's α with a desired minimum level of .70. Observed reliability of the constructs in previous research are presented in Table 1. Based on these data, the researcher expected an acceptable level of consistency for the items. However, attention was given to the new constructs of CA and FS, as no previous studies have utilized these items to represent the operationalized constructs. Construct reliability was evaluated as part of the measurement model assessment presented in Chapter 4. Observed Cronbach's α between .83 and .93 established a high level of internal consistency in the constructs measured.

Procedures

Stratified lists of AACSB-accredited entities in the United States, as identified in the Participants section, were loaded into Microsoft Excel (Association for the Advancement of Collegiate Schools of Business (AACSB), 2017). Each list item included the RAND() function to obtain a random value between 0 and 1, with a precision to 6 places. The lists were then sorted by the random value and the lowest *n*-number (defined in Table 2) selected for contact. The name, title, and email addresses for the selected entities' dean or lead administrator were then be obtained from public websites.

Direct email addresses or contact information for all faculty in the selected entities were not available to the researcher. Web-scraping of faculty emails would have been possible, based on public domain information, however such activity is in conflict with published ethics for

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Table 1

Instrumentation Constructs, Item Sources, and Prior Observed Reliabilities

Construct	No. Items	Items Source	Observed Reliability (Cronbach α)	
Social Influence	4	Venkatesh et al. (2003)	.84	(Kang, Im, & Hong, 2017)
			.87	(Moon, 2016)
			.74	(Parameswaran et al., 2015)
			.78	(Tan, 2013)
Performance Expectancy	4	Venkatesh et al. (2003)	.86	(Kang et al., 2017)
			.87	(Moon, 2016)
			.77	(Parameswaran et al., 2015)
			.84	(Tan, 2013)
Effort Expectancy	4	Venkatesh et al. (2003)	.91	(Kang et al., 2017)
			.88	(Moon, 2016)
			.77	(Parameswaran et al., 2015)
			.87	(Tan, 2013)
Facilitating Conditions	4	Venkatesh et al. (2003)	.52	(Kang et al., 2017)
			.88	(Moon, 2016)
			.77	(Parameswaran et al., 2015)
			.87	(Tan, 2013)
Change Agency	4	G. C. Moore and Benbasat (1991)		— [a]
	2	Perez et al. (2017)		— [a]
Functional Support	5	Cronin and Taylor (1992)		— [a]
	1	Venkatesh et al. (2003)		— [a]
Behavioral Intent	3	Venkatesh et al. (2003)	.87	(Moon, 2016)
			.86	(Parameswaran et al., 2015)
			.85	(Tan, 2013)

[a]No previous reliability estimates published for the item/construct combination utilized.

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survey research (American Association for Public Opinion Research, 2015; Council of American Survey Research Organizations, 2011). As a feasible alternative, the researcher initiated contact with faculty through the deans of colleges and schools of business randomly selected through stratification. To aid in gaining access to social systems, the researcher obtained the assistance and endorsement of a senior associate dean at a ranked college of business for initial email contact with deans.

The Senior Associate Dean at the Sam M. Walton College of Business emailed correspondence (see *Appendix C*, part 1) to 150 deans at AACSB-accredited colleges of business, providing endorsement and a request to forward the researcher's email to faculty distribution lists in their college or school of business. The researcher followed up approximately 15 minutes later with the study invitation email (see *Appendix C*, part 2) requesting forwarding.

Survey links contained in the emails included entity-level unique identifier keys. These keys were utilized to track which institutions had respondents in the data. On Monday of week three of the survey timeframe, a reminder email (see *Appendix C*, part 3) was sent by the researcher to deans of each institution with no responses in the data, based on the unique key. At week five of the survey timeframe, a second reminder was sent by the Walton College Senior Associate Dean (see *Appendix C*, part 4) followed by an email from the researcher (see *Appendix C*, part 5). Survey terminated at the start of week seven.

Upon IRB approval, the web-based survey instrument was delivered to recruited participants using the Qualtrics Survey platform. The survey delivery was only through this platform. Concerns regarding introduced bias due to lack of computer access were not applicable given the focus of technology acceptance investigated. The survey was optimized for

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both computer and mobile device completion and fully compliant with Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794 (d)) ensuring accessibility of the survey to those with impairments. Additionally, the survey was constructed to *request completion* of each question, rather than *forced* or *required completion*. Through request-completion mechanisms, the participant was notified when a question was left unanswered and requested completion of that question – participants may then continue unanswered or answer. This method lessened the likelihood of accidental omissions resulting in inadvertent missing data.

Participants

The population of interest included all full- and part-time faculty at business schools accredited by the Association for the Advancement of Collegiate Schools of Business (AACSB) in the United States. United States business school faculty population demographics estimates were based on responses by 521 AACSB-accredited business schools which completed the 2015/2016 Business School Questionnaire (BSQ) (Association for the Advancement of Collegiate Schools of Business (AACSB), 2017). Responses indicated full-time tenured faculty were 73.4% male and 26.6% female. Full-time tenure track faculty were 63.1% male and 36.0% female. Full-time nontenure-track were 61.9% male and 38.1% female. Overall, full-time faculty were 68.2% male and 31.8% female. Part-time faculty were reported in terms of full-time equivalence (FTE) in the BSQ, or 69.3% male and 30.7% female FTE. At the business school level, public (68.9%), private not-for-profit (30.5%), private for-profit (0.4%) and service academy (0.2%) entities were represented in the BSQ data. Additionally, schools at the bachelors (6.8%), masters (66.8%), and doctoral granting (26.4%) levels were included.

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To aid in ensuring a representation of faculty across institutional control and degree granting types, a first-level proportionate stratified random sample with second-level convenience sampling was employed. Assuming a low estimate of 20% forwarding and 20% response rates observed in prior studies (Nulty, 2008) A "20% of 20%" response estimation method was used to determine the number of entities for contact. The 2x3 matrix of population statistics for sampling decisions are presented in Table 2. To achieve a sample size of 200 respondents in an efficient sampling frame, the researcher omitted from stratifications which would result in inefficient outcomes in relation to the number of entities contacted. Private not-for-profit and public bachelor's-only degree granting institutions were removed from the sampling frame, as the likely estimate of respondents would not warrant the additional effort required on the part of the first-level entity contacts (i.e., Deans). Based on the remaining four stratification groups, a total of 75 entities were initially selected.

Forward rate estimates were achieved, with 28.7% of business school deans forwarding the invitation to faculty lists. Forward rates were confirmed by at least one faculty response in the data. Actual second-level faculty response rates, presented in Table 3, were at 5.2%; far below the expected 20% or roughly one quarter of the expected rate. Approximately half way through the sampling frame, the researcher determined that the initial contact with 75 deans would not result in the desired sample size. A modification to the research protocol was approved to expand the recruiting to an additional 75 deans. The second wave of recruiting, beginning mid-November, resulted in higher response rates and achieved the overall sample desired.

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Table 2

Population Estimates of Schools of Business for Sampling Stratification.

	Entities (Avg. Faculty)	Entity Contact	Projected FWD *n* (Faculty *n*)	Projected Responses (% of Total)	Population (% of Total)
Private Not-for-Profit					
Bachelor's Granting	11 (30)	5	1 (6)	6 (2.6)	326 (0.7)
Master's Granting	115 (62)	15	3 (12)	37 (16.1)	7,133 (15.0)
Doctoral Granting	32 (97)	5	1 (19)	19 (8.4)	3,099 (6.5)
Public					
Bachelor's Granting	24 (25)	5	1 (5)	5 (2.2)	924 (1.9)
Master's Granting	229 (56)	40	8 (11)	90 (38.7)	19,966 (42.1)
Doctoral Granting	104 (124)	15	3 (25)	75 (32.2)	16,018 (33.7)

Data source: AACSB Data Direct 2015/2016 BSQ, Faculty Survey, United States.

Table 3

Achieved Response Rates by institutional control and degree-granting level.

	Responses	All Faculty[a]	Response %
Private Not-For-Profit			
Master's Granting	21	363	5.8
Doctoral Granting	20	582	3.4
Public			
Master's Granting	73	1370	5.3
Doctoral Granting	95	1714	5.5
Overall	209	4029	5.2

[a] Total number of faculty in colleges with confirmed forwards.

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Protection of Human Subjects

While no direct interaction between researcher and participant occurred in the study, the indirect interaction between the researcher and participant through the entity leadership and survey methods was deemed human subject research. No known potential risks existed with participation in this study. While institution-level unique keys were added to survey links for tracking institutions for reminder purposes, the web-based survey was fully anonymous – no private or personally identifiable information was collected and internet protocol address capturing was turned off. The identity of a participant could not be associated with the responses submitted or ascertained by the researcher. Total estimated time for completion of the survey, including all logic-gate branches, was 12 minutes for the research survey and 3 minutes for the gift-card opt-in survey. Actual average completion time observed was well below original estimates at 5 minutes 33 seconds (in seconds, $M = 273.40$, $SD = 113.57$).

Informed consent was provided to the participants as the first screen of the survey. Statements regarding of the risks, benefits, and procedures involved in the research were presented. Due to the anonymous nature and online-only survey design, implied consent through direct agreement to participate (see *Appendix B*, introductory screen) was determined as tacit indication that participant knowingly agreed to participate. Potential participants were presented with an additional option on the consent screen to decline participation. Furthermore, participants were informed that they may exit at any time and their responses up to that point would be discarded. Lastly, prior to final submission, participants were presented with a final option to revoke/withdraw consent or to continue to submission – revoking consent removed all responses of that participant from the data.

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After submission, participants were provided with an opportunity to opt-in to a gift card drawing. Participants that had opted-in were forwarded to a second survey, see *Appendix B*, that was designed to collect contact information for potential award of drawing(s). Although the second survey collected personally identifiable information, no record in either the research survey or the opt-in survey contained links to respondent data in the other. Access to the opt-in survey was restricted to visitors referred from the research survey. Inclusion in the opt-in data, however, implied prior participation in the research survey although no link to actual responses are possible.

A direct benefit to participants was the opportunity to win a gift card. A random drawing was held at the culmination of data collection. The drawing awarded gift cards from a major online entity – entity choice of the winner. For each 50 respondents, a random drawing was held for one $25 gift card. A maximum of four gift cards were available. Random drawing was conducted as follows: 1) opt-in survey data imported to Excel, 2) column added that includes the RAND function, then 3) sorting the random column from smallest value to largest, the top *n*-rows was selected as the selected participants. Although only 78 participants opted-in to the drawing, with a total of 209 responses in the research survey data, four gift cards were awarded. Contact was made by email prior to sending the gift card to the participant to ensure correct addressing.

The Qualtrics survey platform maintains the high security standards ensuring research and participant data security and reliability compliant with Federal Acts (Qualtrics, 2017). Once survey data had been retrieved from the secure online survey system, the original responses in the system were purged. As a final mechanism to protect confidentiality, the researcher securely stored the data obtained from the two surveys once no longer actively used for research. Opt-in

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data was archived once gift cards were awarded and confirmed by the three selectees. Research data was archived upon data analysis conclusion. The method of secure storage was zipping the files in a strong-password protected file with 258-bit Advanced Encryption Standard (AES), with the password only known to the researcher.

Data Analysis

To address all research questions and hypotheses, path analysis techniques were used to examine the direct and indirect effects between and among the variables. As a combination of multiple regression, factor analysis, and path analysis, structural equation modeling (SEM) is a statistical approach to test multivariate model relationships (Bagozzi & Yi, 2012; Hair, Ringle, & Sarstedt, 2011; Hoyle, 2012). SEM supported testing of hypothesized relationships and significance between observed measurement variables and latent variables, or factors. A structural model consists of a theoretical structure model, or inner model, and a measurement model, or outer model. The inner model illustrates the theorized relationships between latent variables and dependent variable. The outer model defines the relationships of the observed variables with the latent variables (Bagozzi & Yi, 2012; Hair et al., 2011; Hoyle, 2012). The outer model facilitates factor analysis testing. While SEM is similar to regression methods, SEM has advantages over regression when analyzing paths involving latent variables and multiple indicators (Gefen, Rigdon, & Straub, 2011).

Generally, there are two families of SEM techniques, covariance- and variance-based (Henseler, Hubona, & Ray, 2016). Of these two families, covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM) have been widely used in information systems research which the current study derives foundational theory (Lowry & Gaskin, 2014). CB-SEM is well suited for model validation where strong prior research supports the underlying theories (Hair et

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al., 2011; Lowry & Gaskin, 2014). PLS-SEM has advantages over CB-SEM for preliminary theory building or extending existing models (Lowry & Gaskin, 2014). PLS-SEM incorporates several statistical analyses not present in CB-SEM, such as principal component analysis, multiple regression, multivariate analysis of variance, and canonical correlation. While CB-SEM provides overall fit statistics for the model, PLS-SEM focuses on the relationships and prediction capabilities of the factors. As the purpose of this study was to investigate the relationships among and between the hypothesized factors and new and previously untested extensions of the UTAUT model with previously validated constructs, PLS-SEM analysis was selected as the data analysis method. PLS-SEM and CB-SEM research received criticism in recent years regarding rigor and transparency (Gefen et al., 2011). The current research followed the recommendations of Gefen et al. (2011) and Chin (2010) in addressing the level of rigor and transparency for PLS-SEM.

Partial Least Squares Structural Equation Model (PLS-SEM) Analysis

Operationalizing the research conceptual framework, the researcher specified the outer and inner models as identified in Figure 9. In the outer model, research instrument (see *Appendix A*) items CA1-6 were reflective of the latent variable Change Agency, FS1-6 were reflective of latent variable Functional Support, and the remaining items followed the established outer model of previous research in UTAUT, e.g., EE1-4 reflective of latent variable Effort Expectancy. The inner model included CA as an indirect effect on BI, moderated by PE, SI, FC, and EE. FS was defined an indirect effect on BI, moderated by FC and EE. While, direct effects of PE, SI, FC, and EE predicted BI. Mediating effects of gender, age, and experience were generally shown as direct effects on BI in the illustrative model; however, for clarity in the diagram, mediations of PE, SI, FC, and EE by GDR, AGE, and EXP were not depicted.

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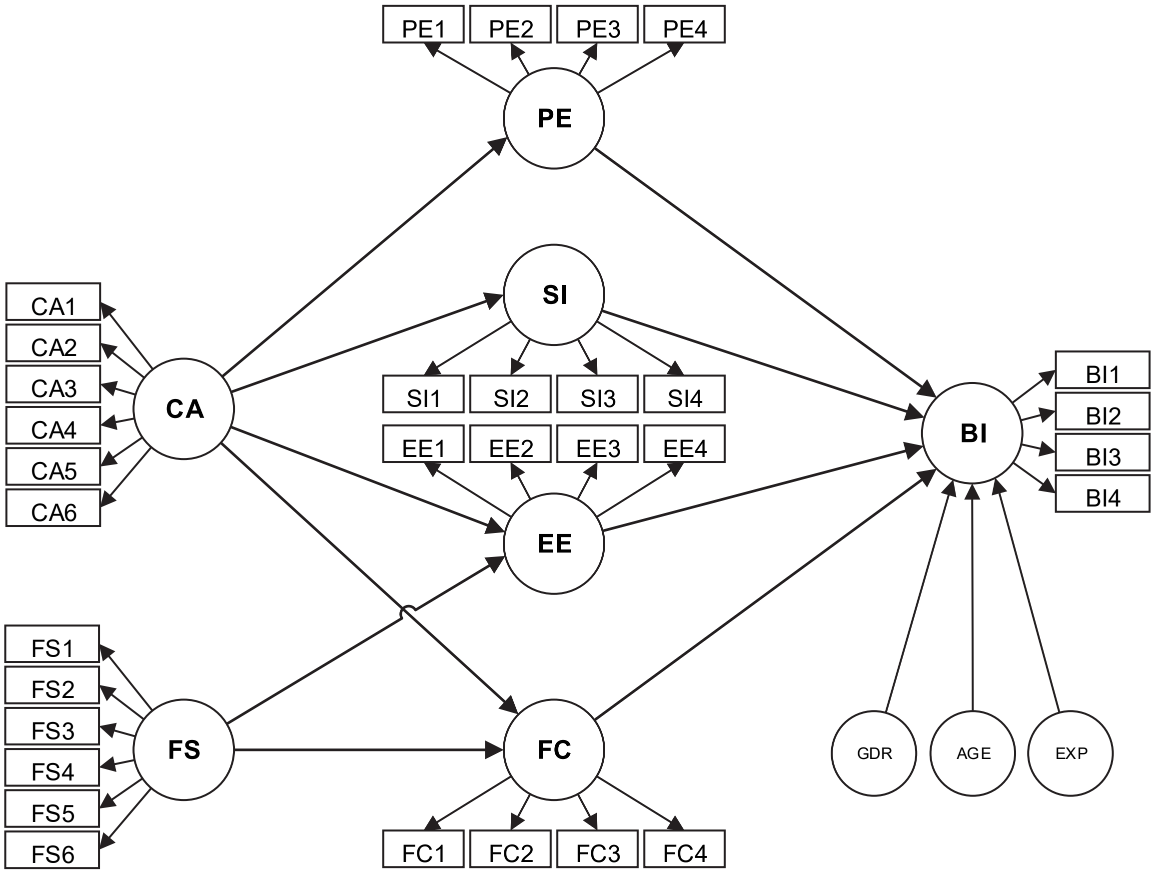

Figure 9. Research Operational Structural Model.

SmartPLS 3.2.7 (Ringle, Wende, & Becker, 2015) was selected for all analyses, unless otherwise identified as originating in Statistical Package for the Social Sciences (SPSS) 24.0. SmartPLS is a robust graphical interface-based PLS package incorporating the latest findings and guidance of latent variable modeling. The software supported a wide array of PLC-oriented techniques, including Consistent PLS (cPLS), bootstrapping, blindfolding/ jackknifing, multi-group, and permutation analysis. With the majority of all analyses having occurred in a single robust package, the likelihood of loss of data fidelity during exports and imports was lessened.

Missing data was addressed in SPSS and Microsoft Excel prior to import to SmartPLS. If less than 5% of data per outer model indicator, less than 15% of data per response row are

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missing, and Little's MCAR (Missing Completely at Random) test was non-significant, the missing data would have been imputed using the expectation-maximization method (Hair, Hult, Ringle, & Sarstedt, 2016). If the above conditions were not met, listwise or pairwise deletion would have be accomplished, depending on the method which achieved the optimal result (Gefen et al., 2011).

While PLS-SEM is robust to mild violations of the multivariate normality assumption, substantial violations of the assumption would have required transformation (Gefen et al., 2011, p. A3). Tests for normality, skewness, and kurtosis were conducted at the observed (indicator) variable level using SPSS. Direct review of skewness and kurtosis statistics was reviewed to determine the degree of deviation and effect on violation.

Construct validity of the reflective constructs, as defined by the operational structural model and *Appendix A,* was evaluated through factor analysis as part PLS execution in SmartPLS. Convergent validity was evaluated by significant t-values of loadings at $\alpha = 0.05$ and overall construct average variance explained (AVE) ≥ 0.5. Loadings not significant would have been removed from the model in order to improve convergence on the factor, however a necessary balance was evaluated to retain a desired number of three observed variables per latent variable when possible. Discriminate validity was evaluated by Fornell-Larcker criterion. Calculated construct AVE and AVE square roots should be greater than the correlations between constructs (Hair et al., 2016; Henseler et al., 2016; Lowry & Gaskin, 2014). A final confirmation of discriminant validity was conducted by evaluation of heterotrait-monotrait values less than .85 and .90 for conceptually similar constructs (e.g., change agency and social influence) (Hair et al., 2016).

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Construct reliability was established through a composite reliability score and Cronbach's α, computed in SmartPLS. As with standards of Cronbach's α, each construct in the model should demonstrate a composite reliability score above 0.70 (Lowry & Gaskin, 2014). Unidimensionality of constructs was evaluated by Cronbach's $\alpha > 0.70$, indicating "only one theoretical and statically underlying factor" exists in the measurement items associated with the construct (Gefen et al., 2011, p. A3).

Common method bias (CMB) was a concern given that the data was obtained from a single instrument at a single point in time (Gefen et al., 2011, p. A3). Additionally, the observed variables contributing to the latent constructs are of an identical question display type (i.e., Likert-like matrices). CMB has the potential of distorting the response data. To evaluate the existence of a CMB present in the data, after validity and reliability evaluations are completed, the researcher conducted a Harman's single-factor tests in SPSS to test for common method variance. Additionally, a full collinearity evaluation assessed the rotated variance inflation factors (VIF) of full dependency models, as described by Kock (2015); Kock and Lynn (2012). VIF values greater than 3.3 would be indicators of the presence of CMB in the data.

A core assumption of PLS-SEM is homogeneity of the sample. While there is no direct test of this assumption in PLS-SEM, the researcher must evaluate for heterogeneity through cross population for latent populations within the data. Hypothesized differences were assumed to exist amongst gender, age, and experience, therefore homogeneity was assumed in regard to these population demographics and accounted for in multi-group analysis of model constructs as specified in hypotheses.

Sample size estimating procedures are not clearly defined in research or procedural guidance's. However, several authors have proposed methods. Based on guidance by Hair et al.

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(2016), the minimum sample size to detect a R^2 of 0.10 in any construct level at a significance of 5% and statistical power of 80% is 113, when using the direct effect complexity of four latent variables on the dependent variable. Using the "10 times" general rule of thumb, which estimates the number of samples as 10 times the number of predictor variables, results in 120 samples – predictors in this rule include hypothesized direct, indirect, and multiplicative, or a total of 12 in the proposed model – however this rule of thumb is not supported by research (Gefen et al., 2011, p. A3). Additional researchers have utilized sample size estimation procedures for linear multiple regression as a foundation for estimation. Based on calculations using G*Power 3.1, a minimum sample of 129 is required to for an f^2 effect size of 0.15, with four direct predictors at a significance of 5%. Of the three methods calculated, the G*Power estimate is the most conservative and was used as the baseline estimates for sampling protocols.

After confirming the soundness of the data, PLS-based evaluations of the outer measurement model, structural model, multi-group analyses, and comparison to the saturated model was conducted and reported. Results of all tests and analysis were reported in accordance with guidance provided by Chin (2010); Gefen et al. (2011); Hair et al. (2016); Lowry and Gaskin (2014).

Limitations of Design

The current study contains four limitations that may have introduced bias in the findings. While survey-based research provides an efficient mechanism to administer to large numbers of potential participants in a wide geographic area, the design also presented limitations that should be considered. Self-selection bias was likely the most influential limitation in the research, given the use of convenience sampling. Self-selection bias occurs when potential respondents determine for themselves whether to participate in a survey. Respondents inclination toward the

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topic of the survey often correlates to participation (Lavrakas, 2008). The observed responses may not have been fully representative of the entire sample based on this limitation. Secondly, as Bagozzi (2007) alluded, many of the construct items were affective in nature regarding beliefs or perceptions. Emotions inherent in intrinsic motivation, joy, or anxiety, for examples, are not accurately measurable on a self-responded single instance Likert-type scale. Thirdly, in relation to prior studies of UTAUT, a potential limitation emerged as the study intended to investigate behavioral intent on a category of technologies (i.e., educational technologies), as recommended for future research (Holden & Rada, 2011), unlike other studies which have focused on a single, multiple, specific technology. Lastly, the BI construct items, adapted from prior research, in the current study may have induced both a reflective and predictive response by respondents, as some respondents may have included intentions based on a prior technology adoption; while others, in an acceptance process and predict usage

IRB Statement

In accordance with the guidelines of the University of Arkansas-Little Rock regarding the protection of human participants, a request for review was be submitted to and approved by the UALR Institutional Review Board (IRB) for approval to survey approximately 200 participants for this study. After receiving IRB approval, participant recruitment, data collection, and analysis began.

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CHAPTER FOUR – RESULTS

The results of analyses of the data collected from survey and existing data are presented in this chapter. The preliminary screening procedures, participant demographics, and foundational assumption checks are presented. Hair et al. (2016) noted that PLS-SEM based hypothesis testing of constructs is only reliable and valid as the measurement model used to define the structural model relationship. Therefore, a significant portion of this chapter is focused on reliability and validity of the measurement model. The remaining addresses the structural model and hypothesis level analysis.

Data Collection and Preliminary Screening

Upon termination of the survey, the researcher exported 206 survey responses from Qualtrics in SPSS format. Variable naming, labeling, type cleanup, decimal length, and other various Qualtrics-related concerns were addressed in SPSS. The data were then extracted to Microsoft Excel to be merged with institution characteristic data obtained from AACSB Data Direct. The resulting data file contained all participant responses and their respective institution's location, faculty full time equivalent (FTE), and similar properties. The combined data file was then imported back to SPSS for preliminary screening.

Data Coding

Numerically recorded survey response values were defined by measure type and nominal or ordinal value groupings, as follows. Faculty Status, Gender, and ISP involvement were defined as nominal measures, with textual value groupings as defined in Appendix A. Age and all Likert-type items were defined ordinal. Years of Experience was recorded as a scale variable. Institution characteristic data, merged from AACSB Data Direct, was coded with Institution

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Type, State, Region, Control, and Degree-granting level as nominal data and faculty counts were defined as scale.

A negatively worded check item (BI4) was reverse coded to a new variable (BI4R). Additional variables were created for use in data screening. These screening variables included Careless Responder, Missing Exceeds 15%, and Unfinished, each defined as a binary value. Scale group variables were created as sums of construct item responses CA, FS, SI, PE, EE, FC, and BI.

Data Screening

Initial data screening focused on identifying unfinished responses (n = 7), flagged by Qualtrics as less than 100% complete (i.e., did not reach the final participation continuance item). Although the researcher believed incomplete responses would be automatically discarded by Qualtrics after 15 days, these data were automatically committed by Qualtrics 15 days after the respondent's final response.

To address quality of the response data, a check of carelessness in responding was conducted. Respondents were identified as careless responders (CR) when BI4 (i.e., "no intention to use educational technologies") was equal to or greater than BI1, 2, or 3, which would imply a logical inconsistency between intentions. CR coding was conducted in Excel using a function to ensure consistency in binary assignments. Three respondents were subsequently coded as careless responses.

Following guidance of Hair et al. (2016), two additional screening checks were conducted. Using formulas in Excel, each respondent row was checked to ensure that no more than 15% of construct response items were missing. The formula included a conditional check of whether the respondent identified they had worked with an ISP. Missing responses in CA and

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FS were not considered when respondents had not worked with an ISP. Upon analysis of missing items, nine responses were identified as missing greater than 15% of expected data.

An evaluation of missing data by construct was conducted. Hair et al. (2016) recommended that no more than 5% of data are missing by construct as a threshold to consider construct exclusion. BI exhibited 3.1% missing data prior to accounting for unfinished, careless responses, and row-level missing data greater than 15%. After filtering for these screening checks, no construct exhibited missing data.

Missing data. After filtering unfinished, careless responses, and responses missing greater than 15% of values, no additional missing data was present in the data.

Sample Size

A total of 12 returned surveys were excluded from the data, based on the screening procedures. A resulting overall sample size of 194 was obtained. The primary research model analysis involves testing of relationships between CA and FS latent variables and the established UTAUT model, therefore an effective sample size of 120 includes only respondents who have worked with ISP in the past. A post hoc analysis of achieved power was calculated using G*Power 3.1.9.2 – a commonly used software to compute statistical power analyses (Faul, Erdfelder, Buchner, & Lang, 2009). An *F* test was the test family for a linear multiple regression, fixed model, and R^2 deviation from zero estimate. The input and output parameters of this computation are presented in Table 4. Observed power was acceptable at 93.3% with a medium effect size.

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Table 4

Input and Output Parameters for Post Hoc Power Analysis

Input Parameters		Output Parameters	
Effect Size (f^2)	.15	Noncentrality (λ)	18.00
α error probability	0.05	Critical F	2.451
Total sample size	120	Numerator df	4
Number of Predictors	4	Denominator df	115
		Power (1 – β error probability)	0.933

Participant Demographics

Participant provided demographic information included gender, age by range, faculty status, years of teaching experience, and educational technologies previously used. Demographic information provided by respondents was merged with institution characteristics from AACSB Data Direct. Institutional characteristics used in this study included college degree granting level and institutional control, as defined by AACSB. Table 5 displays frequency and percentage for each variable set. Of 194 respondents, 52.6% were male and 45.9% female. A remaining 1.5% were transgender or preferred not to identify their gender. Transgender and *prefer not to say* are not presented in the following demographic table for population reference, as this group was not included in further analysis due to low representation in the data. Respondents were primarily tenured males, 19.6%, while the second largest group were full-time non-tenure track females, 14.9%. Participants were primarily 45 to 54 years of age, with a roughly equal distribution of males (15.5%) and females (16.0%) in that range. The smallest response group were aged 75 and over (1.0%), all of which were male.

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Table 5

Participant Demographic Characteristics by Prior ISP Contact and Gender

Worked with ISP	Yes		No	
Gender	Male	Female	Male	Female
Age				
25 – 34	1 (0.8%)	7 (5.9%)	4 (5.6%)	5 (6.9%)
35 – 44	16 (13.4%)	12 (10.1%)	13 (18.1%)	7 (9.7%)
45 – 54	19 (16.0%)	23 (19.3%)	11 (15.3%)	8 (11.1%)
55 – 64	10 (8.4%)	17 (14.3%)	8 (11.1%)	7 (9.7%)
65 – 74	10 (8.4%)	3 (2.5%)	8 (11.1%)	
75 and over	1 (0.8%)		1 (1.4%)	
Faculty Status				
Part-Time	4 (3.4%)	7 (5.9%)	5 (6.9%)	6 (8.3%)
FT Tenure Track	15 (12.6%)	21 (17.6%)	13 (18.1%)	8 (11.1%)
FT Tenured	14 (11.8%)	16 (13.4%)	13 (18.1%)	5 (6.9%)
FT Non-Tenure Track	24 (20.2%)	18 (15.1%)	14 (19.4%)	8 (11.1%)
Institutional Control				
Public	44 (37.0%)	48 (40.3%)	37 (51.4%)	23 (31.9%)
Private Not-For-Profit	13 (10.9%)	14 (11.8%)	8 (11.1%)	4 (5.6%)
Degree Granting				
Masters Granting	21 (17.6%)	37 (31.1%)	16 (22.2%)	11 (15.3%)
Doctoral Granting	36 (30.3%)	25 (21.0%)	29 (40.3%)	16 (22.2%)
Geographic Region				
Midwest	11 (9.2%)	9 (7.6%)	7 (9.7%)	1 (1.4%)
Northeast	5 (4.2%)	6 (5.0%)	5 (6.9%)	5 (6.9%)
South	36 (30.3%)	39 (32.8%)	28 (38.9%)	18 (25.0%)
West	5 (4.2%)	8 (6.7%)	5 (6.9%)	3 (4.2%)
Total	57 (47.9%)	62 (52.1%)	45 (62.5%)	27 (37.5%)

Notes: FT = Full Time. Percentages are displayed by variable at the first-level (i.e., ISP yes vs no).

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A majority (61.9%) of faculty respondents have worked with ISP in the past. The proportion observed in the data closely resembled that of Intentional Futures (2016) ISP-based respondents (cf., Inside Higher Ed, 2017). A greater proportion of female respondents (69.7%) indicated they have worked with ISP than that of male respondents (55.9%), $z = 1.960$, $p = 0.025$. Respondents primarily represented public (79.9%) and doctoral granting (55.7%) institutions. Male faculty were most likely from a public doctoral granting institution, while females most likely from public masters granting institutions. Forty colleges of business are represented in the data. Colleges in the southern United States made up a substantial majority of the survey respondents, 63.9%.

Years of teaching experience were observed similar for males who had worked with ISP and those who had not ($M = 18.6$, $SD = 10.6$ and $M = 17.8$, $SD = 11.8$, respectively) as well as females ($M = 15.4$, $SD = 9.2$ and $M = 14.9$, $SD = 10.4$, respectively), with female faculty in the sample exhibiting fewer years of teaching experience overall.

Respondents' prior use of educational technologies are displayed in Figure 10. The three most frequently indicated technologies used were Online Learning Systems (78.9%), Standard Desktop Software (68.6%), and Video or Lecture Capture Systems (64.4%). The three least cited technologies include Intelligent Tutors (1.0%), Assessment Tools (6.7%), and Adaptive Learning Systems (14.4%). Respondents identified three additional technologies through open response. These additional technologies primarily included utility-oriented tools and course content.

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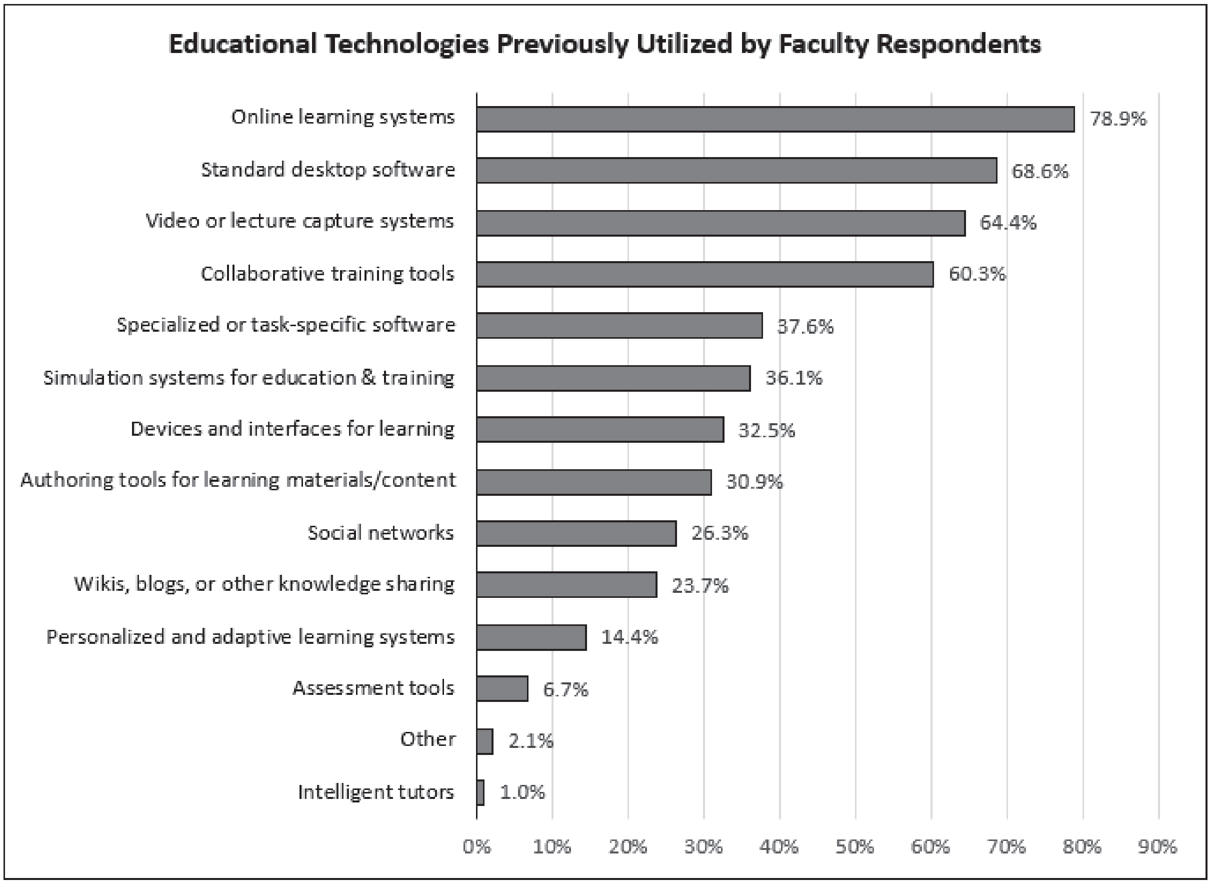

Figure 10. Distribution of Participants' Prior Use of Educational Technologies (N = 194).

Scale and Item Descriptive Statistics

Prior to refinement of scale measurement items, Cronbach's α and Guttman's λ_2 were computed for the latent variable scales of CA, FS, SI, PE, EE, FC, and BI; which are presented in Table 6. An alpha or lambda-2 value greeter than 0.7 indicates acceptable levels of internal consistency in Likert-type scales. All scales were observed above acceptable levels. The lowest observed internal consistency statistics were FC at $\alpha = 0.790$ and $\lambda_2 = 0.793$. FS and BI statistics indicated excellent internal consistency for these scales, $\alpha = 0.906$, $\lambda_2 = 0.910$ and $\alpha = 0.941$, $\lambda_2 = 0.945$, respectively.

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Table 6

Latent Variable Scale Internal Consistency Statistics Prior to Factoring

	Cronbach α	Guttman λ_2
Change Agency (CA)	0.861	0.861
Functional Support (FS)	0.906	0.910
Social Influence (SI)	0.845	0.854
Perceived Effort (PE)	0.891	0.897
Effort Expectancy (EE)	0.898	0.901
Facilitating Conditions (FC)	0.790	0.793
Behavioral Intent (BI)	0.941	0.945

Descriptive statistics were calculated for the latent variables and associated scale items – presented in Table 7. The mean for the CA scale was 22.90, with a standard deviation of 4.55. CA3 and CA5 exhibited the greatest standard deviations, SD = 1.20 and 1.11 respectively, indicating the greatest variation in participant response patterns. The mean for the FS scale was 23.27, with a standard deviation of 5.29. All FS item standard deviations exhibited few difference in variation of participant response patterns across the scale. The mean for the BI scale was 16.89, with a standard deviation of 3.85. All BI item standard deviations exhibited similar differences in variation in response patterns across the scale.

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Table 7

Scale and Measurement Items Descriptive Statistics

	Min	Max	Range	Mean	Median	Mode	SD
CA[a]	6	30	24	22.90	24	24	4.55
CA1	1	5	4	4.03	4	4	0.88
CA2	1	5	4	3.98	4	4	0.88
CA3	1	5	4	3.28	3	4	1.20
CA4	1	5	4	3.93	4	4	0.94
CA5	1	5	4	3.51	4	4	1.11
CA6	1	5	4	4.18	4	4	0.87
FS[a]	6	30	24	23.27	24	23	5.29
FS1	1	5	4	4.00	4	4	0.94
FS2	1	5	4	3.87	4	5	1.17
FS3	1	5	4	3.98	4	5	1.07
FS4	1	5	4	4.04	4	4	0.99
FS5	1	5	4	3.73	4	4	1.12
FS6	1	5	4	3.65	4	4	1.11
SI[b]	4	20	16	13.07	13	14	3.68
SI1	1	5	4	3.32	3	3	1.04
SI2	1	5	4	3.22	3	3	1.05
SI3	1	5	4	2.98	3	3	1.20
SI4	1	5	4	3.55	4	4	1.15
PE[b]	4	20	16	15.20	16	20	3.65
PE1	1	5	4	4.04	4	4	0.89
PE2	1	5	4	3.75	4	5	1.09
PE3	1	5	4	3.62	4	5	1.19
PE4	1	5	4	3.80	4	4	1.01
EE[b]	4	20	16	15.06	16	16	3.69
EE1	1	5	4	3.68	4	4	1.02
EE2	1	5	4	3.83	4	4	1.07
EE3	1	5	4	3.74	4	4	1.10
EE4	1	5	4	3.81	4	4	1.03
FC[b]	4	20	16	13.46	14	14	3.52
FC1	1	5	4	3.49	4	4	1.12
FC2	1	5	4	3.73	4	4	1.04
FC3	1	5	4	3.37	3	4	1.04
FC4	1	5	4	2.88	3	3	1.28
BI[b]	4	20	16	16.89	18	20	3.85
BI1	1	5	4	3.99	4	5	1.16
BI2	1	5	4	4.06	4	5	1.13
BI3	1	5	4	4.32	5	5	0.96
BI4R	1	5	4	4.51	5	5	0.93

[a]$N = 120$. [b]$N = 194$.

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Data Examination and Analysis

Pre-modeling data examinations included evaluation of outliers, skewness, and kurtosis. The recommendations of Hair et al. (2016) were the primary guidance of general data appropriateness prior to formal assessment of the measurement model.

Outliers and Normality

All but one variable (i.e., years of teaching experience) were ordinal with five or fewer intervals, thus extreme value outliers cannot exist. For *experience*, the researcher examined a boxplot for outliers. Experience plotted against gender, revealed two potential outliers, however, experience plotted against age, revealed none. The researcher considered the extreme values to be valid responses and thus no basis for removing the responses.

As an a limited information approach (Dijkstra, 1983), PLS-SEM has been shown to be quite robust regarding violations of normality (Hair et al., 2016). PLS, "involves no assumptions about the population or scale of measurement" (Fornell & Bookstein, 1982, p. 443) therefore has no distributional assumptions and works with nominal, ordinal, and interval scaled variables. Although PLS is robust against nonnormality, Hair et al. (2016) cautioned about extreme non-normality in that, "it is important to verify the data are not too far from normal as extremely nonnormal data prove problematic in the assessment of the parameters' significance" (p. 61) as underlying PLS significance tests (i.e. *t* tests) can be affected (Garson, 2016). Extreme nonnormality has the potential to inflate standard errors in bootstrapping routines, increasing likelihood of Type I errors. The ability to detect between group differences in the DV diminish as data approaches extreme nonnormality. The evaluation of normality, or more specifically *extreme* nonnormality, was the focus of normality assumption verification in this study.

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Skewness and kurtosis statistics were obtained using SPSS and are presented in Table 8, below. Observing the skewness and kurtosis statistics output, 11 of 32 indicator variables exhibited some degree of nonnormality (identified by bold formatting), based on Hair et al. (2016) guidance – skewness and kurtosis statistics exceeding absolute 1.0. Monte Carlo simulations of Curran, West, and Finch (1996) found that nonnormality becomes problematic when statistic absolute values approach at least 2.0 for skewness and 7.0 for kurtosis. Based on extreme normality standards, BI4R (skewness = -1.956) remained as the only concern for extreme normality. BI4R was an indicator variable within the BI construct scale. An analysis of scale normality statistics indicated that BI was nonnormal and was moderately approaching extreme nonnormality on the skewness statistic. As a cross validation, a new BI-Plan scale was derived from BI, removing BI4R, consisting of the original positively worded items. The new BI-Plan, while still indicating nonnormality, was backed away from extreme nonnormality. Considering these findings, the researcher flagged BI4R and the BI scale for monitoring during analysis; however, no additional concerns arose during outer or inner model assessment. As the study variables were direct response Likert-type scales, skewness was not a primary concern.

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Table 8

Skewness and Kurtosis of Indicator and Scale Variables

	Skewness	Kurtosis		Skewness	Kurtosis
CA1	**-1.164**†	**1.706**†	CA4	**-1.218**†	**1.508**†
CA2	**-1.363**†	**2.802**†	CA5	-0.399	-0.614
CA3	-0.297	-0.763	CA6	**-1.374**†	**2.470**†
FS1	-0.941	0.765	FS4	**-1.139**†	**1.046**†
FS2	-0.879	-0.113	FS5	-0.742	0.014
FS3	-0.974	0.379	FS6	-0.635	-0.332
SI1	-0.242	-0.262	SI3	-0.032	-0.876
SI2	-0.032	-0.316	SI4	-0.662	-0.374
PE1	-0.963	**1.070**†	PE3	-0.502	-0.637
PE2	-0.493	-0.601	PE4	-0.621	-0.044
EE1	-0.499	-0.271	EE3	-0.680	-0.195
EE2	-0.857	0.331	EE4	-0.622	-0.252
FC1	-0.448	-0.627	FC3	-0.362	-0.433
FC2	-0.646	-0.136	FC4	0.044	**-1.063**†
BI1	**-1.049**†	0.187	BI3	**-1.626**†	**2.497**†
BI2	**-1.219**†	0.722	BI4R	**-1.956**††	**2.995**†
CA Scale	-0.735	0.994	EE Scale	-0.711	0.078
FS Scale	-0.925	0.415	FC Scale	-0.310	-0.261
SI Scale	-0.173	-0.042	BI Scale	**-1.538**†	**1.874**†
PE Scale	-0.653	0.247	BI-Plan Scale	**-1.284**†	**1.153**†

Note. Bold indicates nonnormality.
†Potential concern for nonnormality, statistic > |1|. ††Concern for extreme nonnormality, skewness approaching 2 or kurtosis approaching 7.

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Reflective Measurement (Outer) Model Assessment

Within PLS-SEM analyses, the measurement model represents the *a priori* defined relationships between the latent variables and the observed data, or indicator variables (i.e., scale items). In the current study, all relationships were theorized as reflective in nature. As reflective, the latent variables manifest as a result of the indicator variables. Hair et al. (2016) provide a three-component evaluation process for reflective model path estimation: assess 1) internal consistency, 2) convergent validity, and 3) discriminant validity. Evaluation of the outer measurement model was conducted using the PLS algorithm configured as: stop condition = 1.0E-7, max iterations = 500, path weighting, and initial weights = 1. The PLS algorithm converged after only 6 iterations for these analyses.

Validity and Reliability

Validity and reliability were established in a two-step process, first at the item level and second at construct. Initial evaluation of the outer loadings, presented in Table 9, revealed two items loaded insufficiently (i.e., outer loadings < 0.7) on the theorized construct scales. Items CA6 and FS1was observed at 0.625 and 0.687, respectively. While loadings greater than or equal to 0.4 and less than 0.7 can be considered sufficient loadings, Hair et al. (2016) recommended relevance testing and comparisons of statistics with and without the lesser loading items. The measurement model was refined with the two suspect items removed and loadings reevaluated. Removal of the items had no negative effect on the outer model loadings on Change Agency or Functional Support, moreover loadings were improved, as displayed in Table 10. Loading statistic improvements for the refined outer model were desirable, therefore CA6 and FS1 were removed from the model for further analysis.

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Table 9

Initial Outer Model Loadings and Cross Loadings

	CA	FS	SI	(PE	EE	FC	BI
CA1	0.841	0.569	0.656	0.353	0.350	0.595	0.463
CA2	0.785	0.450	0.532	0.356	0.347	0.419	0.572
CA3	0.810	0.587	0.622	0.469	0.436	0.536	0.406
CA4	0.793	0.626	0.587	0.158	0.147	0.395	0.222
CA5	0.772	0.617	0.645	0.396	0.312	0.467	0.352
CA6	0.625	0.444	0.513	0.291	0.227	0.333	0.400
FS1	0.390	0.678	0.314	0.129	0.138	0.331	0.223
FS2	0.671	0.813	0.532	0.476	0.409	0.477	0.544
FS3	0.612	0.874	0.518	0.288	0.197	0.499	0.298
FS4	0.612	0.905	0.609	0.378	0.219	0.510	0.357
FS5	0.646	0.878	0.648	0.342	0.183	0.521	0.347
FS6	0.546	0.803	0.497	0.312	0.203	0.511	0.289
SI1	0.579	0.383	0.803	0.370	0.310	0.418	0.437
SI2	0.666	0.520	0.881	0.489	0.399	0.531	0.445
SI3	0.681	0.596	0.879	0.465	0.391	0.643	0.417
SI4	0.690	0.662	0.839	0.414	0.309	0.640	0.406
PE1	0.422	0.323	0.443	0.824	0.556	0.442	0.647
PE2	0.275	0.369	0.374	0.823	0.488	0.416	0.466
PE3	0.417	0.347	0.433	0.898	0.604	0.512	0.607
PE4	0.377	0.333	0.471	0.841	0.501	0.304	0.584
EE1	0.490	0.412	0.499	0.537	0.815	0.638	0.583
EE2	0.287	0.133	0.304	0.563	0.891	0.546	0.472
EE3	0.302	0.210	0.282	0.583	0.910	0.478	0.498
EE4	0.295	0.168	0.322	0.554	0.893	0.483	0.505
FC1	0.504	0.579	0.563	0.370	0.435	0.837	0.349
FC2	0.496	0.397	0.493	0.491	0.667	0.812	0.575
FC3	0.503	0.499	0.572	0.389	0.471	0.826	0.402
FC4	0.454	0.412	0.518	0.349	0.425	0.774	0.357
BI1	0.526	0.411	0.481	0.645	0.537	0.489	0.912
BI2	0.489	0.407	0.451	0.613	0.506	0.466	0.941
BI3	0.464	0.370	0.475	0.676	0.577	0.541	0.900
BI4R	0.412	0.346	0.393	0.545	0.528	0.387	0.860

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Table 10

Revised Outer Model Loadings

	CA	FS	SI	(PE	EE	FC	BI
CA1	**0.856**						
CA2	**0.787**						
CA3	**0.832**						
CA4	**0.781**						
CA5	**0.784**						
FS2		**0.821**					
FS3		**0.863**					
FS4		**0.910**					
FS5		**0.898**					
FS6		**0.807**					
SI1			**0.799**				
SI2			**0.878**				
SI3			**0.882**				
SI4			**0.842**				
PE1				**0.822**			
PE2				**0.826**			
PE3				**0.900**			
PE4				**0.839**			
EE1					**0.815**		
EE2					**0.892**		
EE3					**0.910**		
EE4					**0.893**		
FC1						**0.836**	
FC2						**0.812**	
FC3						**0.824**	
FC4						**0.776**	
BI1							**0.912**
BI2							**0.941**
BI3							**0.900**
BI4R							**0.860**

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After refining the outer measurement model indicator variable relationships, construct-level reliability and validity were reverified through Cronbach's α, composite reliability, average variance extracted, Fornell-Larker Criterion, and heterotrait-monotrait ratio (HTMT). Composite Reliability and Cronbach's α statistics, presented in Table 11, for all constructs were observed considerably greater than the minimum threshold for both criteria (i.e., 0.70) (Hair et al., 2016), establishing an high level of internal consistency reliability. Average Variance Extracted for all constructs exceeded the minimum threshold of 0.50 (Hair et al., 2016), establishing convergent validity.

Table 11

Construct Reliability Measures

	CR ρ_c	Cronbach α	AVE
BI	0.947	0.925	0.817
CA	0.904	0.868	0.654
EE	0.931	0.902	0.771
FC	0.886	0.828	0.660
FS	0.934	0.912	0.741
PE	0.910	0.869	0.718
SI	0.913	0.873	0.724

Notes: CR = Composite Reliability. AVE = Average Variance Extracted.

Discriminate validity was established through the Fornell-Larker Criteria and HTMT. The Fornell-Larker Criteria requires that the square root of each construct AVE be higher than all correlations with the construct. In Table 12, the AVE square root is displayed in bold along the diagonal, while the correlated constructs are along the vertical. As each correlation is less than the square root of the AVE for each construct, discriminate validity is partially established.

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Table 12

Discriminate Validity Fornell-Larker Criteria

	BI	CA	EE	FC	FS	PE	SI
BI	0.904						
CA	0.505	0.809					
EE	0.595	0.406	0.878				
FC	0.524	0.605	0.622	0.812			
FS	0.432	0.713	0.286	0.585	0.861		
PE	0.689	0.442	0.639	0.497	0.421	0.847	
SI	0.500	0.756	0.415	0.661	0.654	0.511	0.851

The HTMT is an alternative and more reliable criterion for discriminate validity in PLS (Hair et al., 2016). HTMT was used as a confirmation check of discriminate validity in the current study. The HTMT should be below the threshold of 0.85 or 0.90 for conceptually similar constructs. Analysis of HTMT ratios presented in Table 13 identify CA→SI exhibited an HTMT of 0.863, requiring bootstrapped confidence interval testing. Evaluation of 2.5% and 97.5% lower and upper bounds of bias-corrected confidence intervals revealed that no construct-pair interval included the value of 1, indicating the HTMT were observed significantly different than 1 and establishing discriminate validity (Henseler, Ringle, & Sinkovics, 2015).

Table 13

Discriminate Validity Heterotrait-Monotrait Ratios

	BI	CA	EE	FC	FS	PE
CA	0.555					
EE	0.640	0.429				
FC	0.587	0.703	0.697			
FS	0.464	0.800	0.293	0.675		
PE	0.754	0.484	0.714	0.577	0.471	
SI	0.555	0.863	0.450	0.773	0.727	0.581

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Common Method Bias

Several potential sources of common method bias (CMB) or *common method variance* existed in the measurement procedures that could have introduced systemic bias (e.g., measurement using a single instrument, multiple constructs on the questionnaire, and acquiescence or mood bias toward the topic or questionnaire) (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In an examination of potential existence of CMB, a Harman's single-factor test was applied in SPSS as a one-factor unrotated extraction. The single factor explained 43.87% of the variance. As the variance explained was observed below 50%, there was no indication of CMB present in the data (Podsakoff et al., 2003; Podsakoff, MacKenzie, & Podsakoff, 2012).

An additional confirmatory test of CMB was accomplished using SmartPLS through full collinearity assessments. In rotation, all factors were defined as dependent upon all other latent factors. Table 14 displays the rotated Variance Inflation Factors (VIF) by dependent and latent variable. Commonly recommended thresholds suggest a conservative VIF greater than 3.3 indicates collinearity and, using the rotation method, also indicates CMB is present (Kock, 2015; Kock & Lynn, 2012). All VIF in the full analysis were observed less than 3.3. Considering the combined results of the Harman's test and full collinearity assessment, the researcher determined that CMB was not present in the data.

Structural (Inner) Model Evaluations

Within PLS-SEM analyses, the structural model represents the *a priori* defined relationships between latent variables. Hair et al. (2016) provide a five-component evaluation process for structural model analysis: assess 1) the model for collinearity, 2) model relationships for significance and relevance, 3) the coefficient of determination, 4) the effect sizes of

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Table 14

Common Method Bias Full Collinearity Variance Inflation Factors

	BI	CA	EE	FC	FS	PE	SI
BI		2.191	2.154	2.200	2.184	1.833	2.226
CA	2.812		3.031	3.033	2.535	3.021	2.386
EE	2.334	2.401		1.893	2.296	1.996	2.400
FC	2.635	2.659	2.071		2.463	2.612	2.395
FS	2.322	2.005	2.263	2.246		2.348	2.415
PE	1.998	2.387	2.047	2.364	2.270		2.294
SI	2.791	2.374	2.785	2.763	3.119	2.816	

relationships, and 5) predictive relevance and effect sizes. Evaluation of the structural model consisted of two distinct evaluations: overall assessment of extending the UTAUT model, in relation to research question one and two, and assessment of moderating group factors, in relation to research question three. Initial evaluation of the structural model was conducted using the PLS algorithm and bootstrapping configurations previously described, as well as blindfolding described herein.

Overall Extension of UTAUT

An evaluation of the overall model with CA and FS extending the traditional UTAUT model was conducted. This evaluation investigated the general effects of the theoretical extensions in the context of previously tested UTAUT constructs. The overall evaluation also provided the basis for assumptions and assessments of the extended model in group factors.

Structural collinearity assessment. Collinearity assessment is an evaluation of the extent that latent variables are correlated. PLS-SEM based collinearity assessments are conducted through an analysis of the variance inflation factor (VIF). VIF values greater than 5.0 are evidence of collinearity in the structural model (Hair et al., 2016). The VIF values of all

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combinations of endogenous and exogenous constructs are presented in Table 15. VIF values observed were below the common threshold of 5.0. Therefore, predictor construct collinearity was not suspect in the overall structural model.

Table 15

Structural Model Collinearity Statistics, Variance Inflation Factors

	BI	EE	FC	PE	SI
CA		2.035	2.035	1.000	1.000
EE	2.187				
FC	2.401				
FS		2.035	2.035		
PE	1.932				
SI	1.974				

Path model coefficients. Within PLS-SEM, the significance of coefficients was established through complete bootstrapping. The overall structural model path coefficients are presented in Figure 11 and Table 16. Seven of the ten path coefficients were significant at α = .05, with four remaining significant at α = .001. The strongest significant coefficient in the structural model was the UTAUT extension CA→SI (β = 0.757, $p < 0.001$). Nonsignificant ($p \geq 0.05$) coefficients included FC→BI (β = 0.086), FS→EE (β = 0.002), and SI→BI (β = 0.116).

Coefficients of determination (R^2) measure the predictive accuracy of the structural model. With values ranging from 0 to 1, higher values indicate greater levels of predictive accuracy in the model. Hair et al. (2016) defined values of 0.25, 0.50, and 0.75 as weak, moderate, and substantial, respectively. In contrast, Cohen (1988) provided guidance toward

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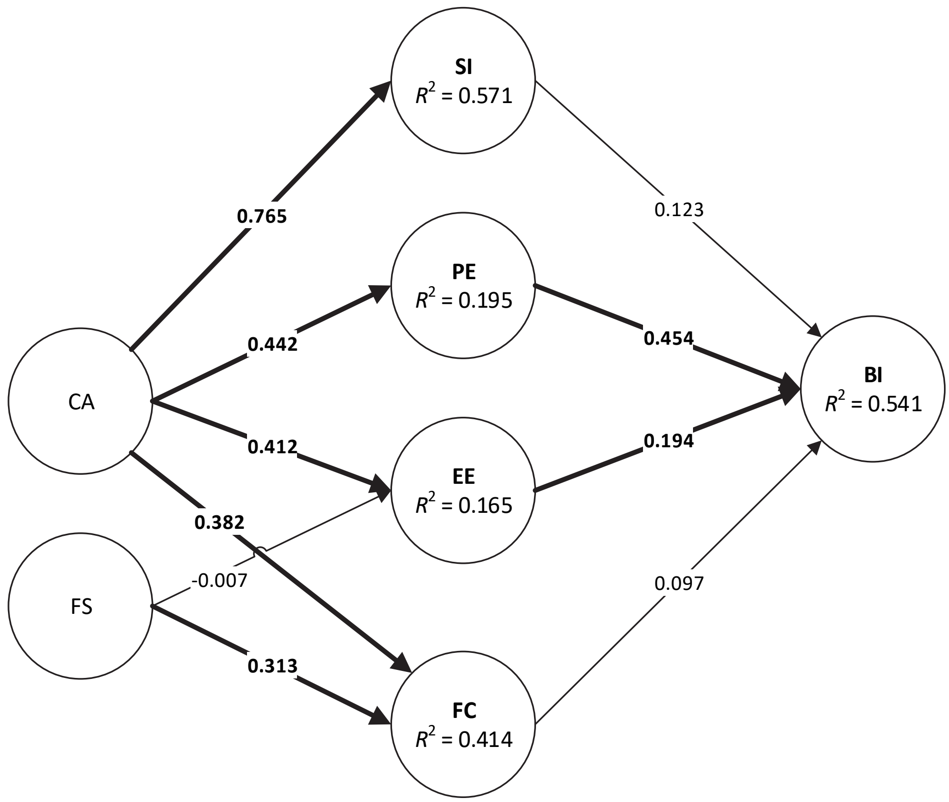

Figure 11. Structural Model Path and Determination Coefficients.
Note: Significant paths are highlighted through bold formatting.

Table 16

Structural Model Path Coefficient Significance Testing

	Original	Sample *M*	*SD*	*t*
CA→EE	0.412	0.412	0.130	3.169**
CA→FC	0.382	0.383	0.094	4.068***
CA→PE	0.442	0.446	0.098	4.515***
CA→SI	0.756	0.757	0.043	17.729***
EE→BI	0.194	0.201	0.097	2.003*
FC→BI	0.097	0.086	0.143	0.676
FS→EE	-0.007	0.002	0.131	0.055
FS→FC	0.313	0.315	0.110	2.844**
PE→BI	0.454	0.464	0.131	3.460***
SI→BI	0.123	0.116	0.110	1.119

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

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values of 0.02, 0.13, and 0.26 for weak, medium, and large and are more often associated with behavioral and education research, unlike Hair's focus in business research. The observed coefficients of determination in the structural model, presented in Table 17, indicate a range of predictive accuracy when interpreted by either Hair et al. or Cohen's guidance. The lowest accuracies are provided by the latent variables CA and FS predicting EE ($R^2 = 0.165$) and CA predicting PE ($R^2 = 0.195$). The strongest accuracy is provided by CA predicting SI ($R^2 = 0.571$), followed closely by SI, PE, EE, and FC predicting BI ($R^2 = 0.541$).

Table 17

Structural Model Coefficients of Determination (R^2)

	R^2	$R^2_{adjusted}$
BI	0.541	0.525
EE	0.165	0.151
FC	0.414	0.404
PE	0.195	0.188
SI	0.571	0.568

An evaluation of structural model relationship effect sizes (f^2) is based on omitting latent variables from the structural model to identify the latent variable's substantive effect on predicted R^2. Hair et al. (2016) and Cohen (1988) define values of 0.02, 0.15, and 0.35 as small, medium, and large, respectively. Through multiple PLS analyses, each round removing a single latent variable, f^2 values were obtained and are presented Table 18 below. Again, the largest effect is CA→SI ($f^2 = 1.332$), indicating an extremely large effect of CA on SI (Ringle, 2017). Interestingly, while CA had a large effect on SI, SI had a very weak effect on BI ($f^2 = 0.017$).

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FS had no discernable effect on EE ($f^2 < 0.001$). Additionally, as with previous evaluations of the UTAUT model, FC had little effect on BI ($f^2 = 0.008$).

Table 18

Structural Model Relationship Effect Sizes (f^2)

	BI	EE	FC	PE	SI
CA		0.100	0.122	0.242	1.332
EE	0.037				
FC	0.008				
FS		0.000	0.082		
PE	0.232				
SI	0.017				

Total effects significance of the structural model constructs on behavioral intent are presented in Table 19. Statistical significances of total effects were evaluated using the bootstrapping procedure. Of the six direct and indirect effects, three were found to be significant – CA→BI ($\beta = 0.410$, $p < 0.001$); EE→BI ($\beta = 0.194$, $p < 0.05$); and PE→BI ($\beta = 0.454$, $p < 0.001$).

Overall model predictive relevance. Predictive relevance was evaluated through cross-validated redundancy, as Stone-Geiser's Q^2 and effect size (q^2) presented Table 20, using PLS blindfolding procedure with an omission distance of seven and algorithm settings remaining constant with previous analyses. Q^2 statistics above zero indicate that the modeled construct has predictive relevance (Hair et al., 2016). Each construct exhibited Q^2 values greater than zero.

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Predictive relevance effect sizes (q^2) were computed manually [$q^2_{\text{IV}\rightarrow\text{DV}} = (Q^2_{\text{IV-included}} - Q^2_{\text{IV-excluded}}) / (1 - Q^2_{\text{IV-included}})$] through multiple blindfolding construct-exclusion iterations (Hair et al., 2016). Interpretations of the effects presented, indicate small to medium predictive relevance.

Table 19

Structural Model Total Effects Significance Testing

	Original	Sample *M*	*SD*	*t*
CA→BI	0.410	0.421	0.073	5.602***
EE→BI	0.194	0.201	0.097	2.003*
FC→BI	0.097	0.086	0.143	0.676
FS→BI	0.029	0.025	0.055	0.522
PE→BI	0.454	0.464	0.131	3.46***
SI→BI	0.123	0.116	0.110	1.119

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 20

Path Model Predictive Relevance (Q^2) and Effect (q^2)

	SSO	SSE	Q^2	q^2
EE	480.000	428.947	0.106	0.018
FC	480.000	359.595	0.251	0.002
PE	480.000	420.822	0.123	0.131
SI	480.000	296.067	0.383	0.005

Notes: SSO = Sum of Squared Observations. SSE = Sum of Squared Prediction Errors.

Confirmation against alternative model. By comparing the path coefficients of the structural model, presented in Chapter 3, to those of an alternative model with all latent variables defined as DV predictors, as illustrated in Figure 12, the researcher verified that the observed

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path relationships support mediation of CA and FS by the traditional UTAUT constructs SI, PE, EE, and FC. Using PLS algorithm, the resulting path coefficients of the alternative CA→BI and FS→BI were observed at β = 0.176 and 0.036, respectively. Significance testing of the coefficients, presented in Table 21, were conducted through blindfolding procedures. Alternative paths were found insignificant while original structural paths remained significant in the analysis. Confirmation against the alternative model establishes mediation of CA and FS, as defined by the structural model.

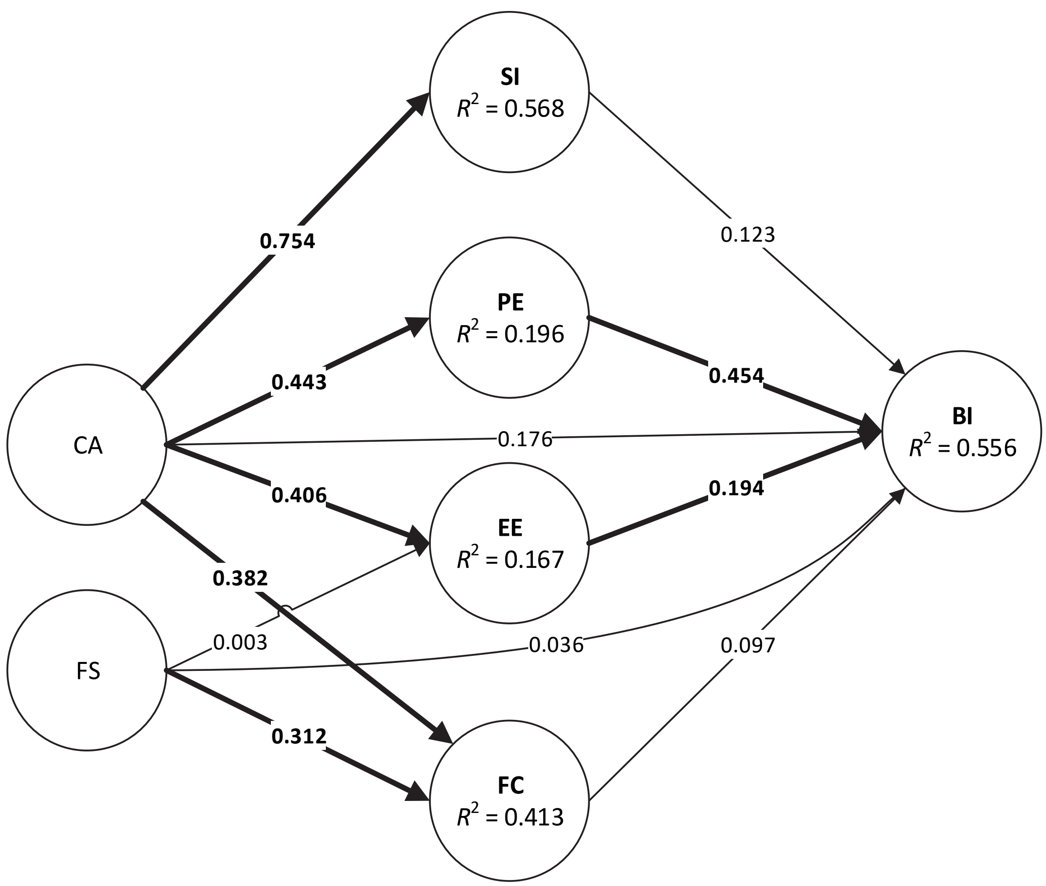

Figure 12. Alternative Structural Model Path and Determination Coefficients.
Note: Significant paths are highlighted through bold formatting.

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Table 21

Alternative Structural Model Path Coefficient Significance Testing

	Original	Sample *M*	*SD*	*t*
CA→BI	0.176	0.156	0.107	1.638
CA→EE	0.406	0.407	0.130	3.127**
CA→FC	0.382	0.386	0.097	3.955***
CA→PE	0.443	0.450	0.093	4.755***
CA→SI	0.754	0.758	0.040	18.760***
EE→BI	0.195	0.193	0.094	2.085*
FC→BI	0.055	0.047	0.147	0.376
FS→BI	0.036	0.034	0.099	0.359
FS→EE	0.003	0.012	0.132	0.020
FS→FC	0.312	0.310	0.116	2.688**
PE→BI	0.444	0.461	0.120	3.713***
SI→BI	-0.001	0.006	0.111	0.008

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Model Extension Summary. Change Agency was established as a significant antecedent of social influence, performance expectancy, effort expectancy, and facilitating conditions. Faculty perceptions of ISP change agency explains 57.1% of variance within the social influence construct. Change agency also explains 19.5% and 16.5% of variance in performance and effort expectancy. Combined with functional support, change agency explains 41.4% of variance in faculty perceptions of facilitating conditions. Functional support was not clearly established in the observed data as an antecedent. Faculty perceptions of functional support was a significant effect on facilitating conditions, however it was not significant on effort expectancy. The extension of the UTAUT model explained 54.1% of variance, with faculty perceptions of ISP change agency exhibiting small to extremely large effect sizes in all defined relationships. Functional support exhibited very little to no effect on the model,

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generally. Based on these findings, the inclusion of change agency in the model is supported, while contribution of functional support is inconclusive, based on the observed data.

Moderating Factors on Extension of UTAUT

Based on a priori assumptions of observed differences in the population, combined with previous UTAUT research findings, moderating group characteristics were evaluated in the context of the extended UTAUT structural model. These observed differences included gender (excluding transgender and unknown, due to low representation), age, and teaching experience. Grouping of respondents by age was determined as roughly generational along the line of Baby Boomer vs post-Boomer. Experience grouping was conducted roughly in line with introductions of large scale online education and learning management systems in 2000.

Each moderation analysis was conducted through PLS permutation and PLS Multi-Group Analysis (MGA)(Sarstedt, Henseler, & Ringle, 2011). Measurement invariance was evaluated using measurement invariance of composite models (MICOM) output to confirm partial or full invariance. Data groups were then compared through PLS MGA using PLS algorithm and bootstrapping to detect differences in path coefficients between the groups. As the scope of the research focused on how these moderating factors effect relationships in the model, significance and effect of the overall model was not tested for each moderation analysis.

Gender moderation. Multigroup analysis requires partial measurement invariance, consisting of configural and compositional invariance. To test this assumption, a PLS permutation analysis was conducted. Configural invariance was assumed for all moderation analyses, as each group were presented with the same instrument and data treatment was conducted on the data set as a whole. MICOM step 2 and 3 output are presented in Table 22. All latent variable correlation permutation *p*-values were nonsignificant, indicating

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compositional invariance was observed for gender-based grouping, satisfying the requirement for partial invariance. Full invariance – composite equality of means and variances – was evaluated to confirm robustness in analysis as pooled data. As all latent variables exhibited significant differences in mean differences between groups, in addition to three significant differences in variance difference, full invariance cannot be confirmed.

Table 22

Measurement Invariance of Composite Models (MICOM) on Gender Groups

	Step 2			Step 3					
	Correlation			Mean Difference			Variance Difference		
	Orig	Perm	*p*	Orig	Perm	*p*	Orig	Perm	*p*
BI	0.999	0.999	0.245	-0.516	0.005	0.003	1.027	-0.027	0.012
CA	0.997	0.998	0.140	-0.359	-0.002	0.036	0.226	-0.011	0.449
EE	1.000	0.995	0.939	-0.659	0.011	0.000	0.479	-0.026	0.072
FC	0.993	0.998	0.062	-0.434	0.009	0.018	0.182	-0.007	0.455
FS	0.995	0.998	0.080	-0.398	-0.004	0.028	0.192	0.000	0.495
PE	0.996	0.998	0.102	-0.705	0.004	0.000	0.576	-0.002	0.020
SI	1.000	0.999	0.631	-0.411	-0.003	0.026	-0.050	-0.005	0.827

Notes: Orig = Original. Perm = Permutation.

A bootstrapped PLS multigroup analysis was performed to determine gender group differences. Results of the analysis are presented in Table 23 below. Differences between path coefficient significances for CA→FC and FS→FC were observed; however, these differences were not statistically significant. A statistical significance was observed for the FC→BI, however neither group coefficient was significant. While some evidence exists in the data to suggest group differences on CA→FC and FS→FC, this evidence is not significantly supported in the observed data.

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Table 23

Multigroup Analysis Results on Gender Groups

	Male (n = 57)			Female (n = 62)			
	β	SD	t	β	SD	t	β_{diff}
CA→EE	0.445	0.187	2.378*	0.393	0.182	2.161*	0.052
CA→FC	0.291	0.155	1.880	0.466	0.115	4.07***	0.175
CA→PE	0.453	0.160	2.823**	0.360	0.113	3.199**	0.093
CA→SI	0.688	0.076	9.106***	0.813	0.045	17.946***	0.125
EE→BI	0.156	0.128	1.215	0.115	0.138	0.836	0.041
FC→BI	0.310	0.181	1.710	-0.174	0.178	0.978	0.484*
FS→EE	-0.034	0.185	0.185	-0.072	0.214	0.339	0.038
FS→FC	0.317	0.181	1.748	0.313	0.127	2.472*	0.004
PE→BI	0.402	0.168	2.398*	0.563	0.145	3.884***	0.161
SI→BI	0.121	0.167	0.723	0.140	0.135	1.039	0.019

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Age moderation. MICOM step 2 and 3 output are presented in Table 24. All latent variable correlation permutation *p*-values were nonsignificant, indicating compositional invariance was observed for age-based grouping, satisfying the requirement for partial invariance. As latent variables CA and FS exhibited significant differences in mean differences between groups full invariance cannot be confirmed.

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Table 24

Measurement Invariance of Composite Models (MICOM) on Age

	Step 2			Step 3					
	Correlation			Mean Difference			Variance Difference		
	Orig	Perm	*p*	Orig	Perm	*p*	Orig	Perm	*p*
BI	1.000	1.000	0.571	-0.176	0.009	0.329	0.302	0.023	0.411
CA	0.999	0.998	0.629	-0.421	0.016	0.032	0.289	0.017	0.379
EE	0.999	0.995	0.823	0.262	0.006	0.159	-0.264	0.011	0.380
FC	0.997	0.997	0.325	0.047	0.009	0.807	-0.326	0.023	0.195
FS	0.997	0.997	0.293	-0.459	0.004	0.015	-0.039	0.019	0.899
PE	1.000	0.998	0.856	0.033	0.009	0.856	0.086	0.018	0.735
SI	0.999	0.998	0.582	-0.312	0.011	0.114	-0.216	0.027	0.401

Notes: Orig = Original. Perm = Permutation.

A PLS MGA was performed to determine age group differences. Differences were observed between path coefficient significances, presented in Table 25, for CA→EE, EE→BI, FC→BI and PE→BI; however, EE→BI was observed as significantly different between the groups ($\beta_{diff} = 0.546$, $p < .01$). While some evidence exists in the data to suggest age group differences on four paths, only EE→BI was supported. Younger faculties' perceived effort expectancy had a greater relation to behavior intent.

Experience moderation. MICOM step 2 and 3 output are presented in Table 26. All latent variable correlation permutation *p*-values were nonsignificant, indicating compositional invariance was observed for grouping based on years of teaching experience, satisfying the requirement for partial invariance. As latent variable PE exhibited a significant difference in mean differences between groups full invariance cannot be confirmed.

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Table 25

Multigroup Analysis Results on Age Groups

	Age < 55 (n = 78)			Age ≥ 55 (n = 42)			
	β	SD	t	β	SD	t	$β_{diff}$
CA→EE	0.540	0.194	2.785**	0.534	0.193	1.371	0.276
CA→FC	0.462	0.109	4.219***	0.449	0.135	2.434*	0.133
CA→PE	0.449	0.124	3.612***	0.463	0.129	3.732***	0.033
CA→SI	0.801	0.044	18.027***	0.803	0.071	9.497***	0.123
EE→BI	0.414	0.120	3.441**	0.412	0.151	0.868	0.546**
FC→BI	0.056	0.153	0.364	0.029	0.180	2.315*	0.362
FS→EE	-0.026	0.201	0.131	-0.002	0.160	0.529	0.111
FS→FC	0.314	0.111	2.837**	0.327	0.164	1.991*	0.013
PE→BI	0.292	0.186	1.569	0.324	0.148	4.175***	0.324
SI→BI	0.118	0.137	0.866	0.111	0.143	0.775	0.229

*p < 0.05. **p < 0.01. ***p < 0.001.

Table 26

Measurement Invariance of Composite Models (MICOM) on Teaching Experience

	Step 2			Step 3					
	Correlation			Mean Difference			Variance Difference		
	Orig	Perm	p	Orig	Perm	p	Orig	Perm	p
BI	0.999	1.000	0.069	0.234	-0.005	0.205	-0.445	0.019	0.269
CA	0.998	0.998	0.348	-0.115	0.006	0.515	0.038	0.010	0.901
EE	0.990	0.996	0.108	0.279	0.001	0.138	-0.046	0.019	0.879
FC	0.998	0.997	0.514	-0.037	-0.001	0.834	-0.244	0.018	0.340
FS	0.997	0.998	0.293	-0.044	0.006	0.802	-0.265	0.007	0.347
PE	0.999	0.998	0.419	0.435	-0.004	0.016	0.015	0.004	0.951
SI	0.999	0.999	0.564	0.024	0.001	0.893	0.053	0.005	0.846

Notes: Orig = Original. Perm = Permutation.

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A PLS MGA was performed to determine experience group differences. Differences were observed between path coefficient significances, presented in Table 27, for CA→EE, CA→PE, EE→BI, FS→FC and SI→BI; however, these differences were not statistically significant. While some evidence exists in the data to suggest group differences on CA→FC and FS→FC, this evidence is not significantly supported in the observed data.

Table 27

Multigroup Analysis Results on Experience Groups

	Experience ≥ 17 Years (n = 54)			Experience < 17 Years (n = 66)			
	β	SD	t	β	SD	t	β_{diff}
CA→EE	0.159	0.250	0.636	0.577	0.143	4.043***	0.418
CA→FC	0.350	0.168	2.083*	0.420	0.115	3.661***	0.070
CA→PE	0.319	0.184	1.737	0.589	0.097	6.103***	0.270
CA→SI	0.795	0.052	15.385***	0.729	0.062	11.835***	0.066
EE→BI	0.095	0.176	0.540	0.342	0.117	2.909**	0.246
FC→BI	0.207	0.247	0.840	-0.134	0.112	1.191	0.341
FS→EE	0.137	0.255	0.536	-0.015	0.130	0.112	0.151
FS→FC	0.234	0.173	1.352	0.404	0.125	3.232**	0.169
PE→BI	0.369	0.185	1.991*	0.627	0.090	6.95***	0.258
SI→BI	0.109	0.223	0.489	0.139	0.070	1.988*	0.030

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Moderation Summary. There is some evidence to suggest faculty demographic characteristics moderate the extended model relationships; however, this evidence is not conclusive. In regard to gender moderation, female faculty were observed with significant effects on CA→FC and FS→FC, however, males were not observed with significant effects, nor were the differences in effect found to be significant between genders.

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Similarly, regarding faculty age, faculty less than 55 years old exhibited significant effects of CA→EE and EE→BI, with older faculty exhibiting significant effects on FC→BI and PE→BI. Only EE→BI was observed as significantly different between age groups. While the findings regarding age were inconclusive, there was some evidence to support a generational difference in value placed on effort versus performance.

Lastly, regarding faculty teaching experience, it appeared that faculty with less experience are more affected by change agency efforts than more experienced faculty. Although no significance was identified in overall effect difference between the groups, a greater number of path significances were observed for faculty with less than 17 years of experience. For this group, all change agency effects were significant, twice that of the over 17 and over group. Of all the multigroup analyses, faculty with under 17 years of experience were the only group in which social influence was found to be a significant effect on behavioral intent.

Summary of Hypothesis Testing

In summary analyses, the following provides a focused review of the key results by hypothesis. Research question level analyses discussion are provided in the concluding chapter.

H1a. *CA has a positive effect on BI.* There was statistically significant evidence that CA has a positive effect on predicting faculty adoption of educational technologies ($\beta = 0.410$, $p < .001$).

H1b. *FS has a positive effect on BI.* While there was an observed positive relationship of FS effect on predicting faculty adoption of educational technologies, this relationship was not statistically significant ($\beta = 0.029$, $p \geq .05$).

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H2a. *SI, PE, EE, and FC mediate a positive effect of CA on BI.* There was statistically significant evidence that SI ($\beta = 0.756$, $p < .001$), PE ($\beta = 0.442$, $p < .001$), EE ($\beta = 0.412$, $p < .01$), and FC ($\beta = 0.382$, $p < .001$) mediated the positive relationship of CA on BI (see, H1a).

H2b. *EE and FC mediate a positive effect of FS on BI.* There was no statistically significant evidence that EE mediated FS ($\beta = -0.007$, $p \geq .05$). However, there was statistically significant evidence that FC mediated a non-significant positive relationship of FS on BI ($\beta = 0.313$ $p < .01$, see H1b).

H3a. *GDR moderates the indirect effects of CA and FS on BI.* Only moderation of the FS→FC relationship indicated a significant moderation effect for females ($\beta = 0.313$, $p < .05$), while no significant moderating effect was observed for males ($\beta = 0.317$, $p \geq .05$). No significant difference was observed between moderating effects of gender on FS→FC ($\beta_{diff} = 0.004$, $p \geq .05$). No additional significant findings were observed related to GDR moderated effects of CA and FS on BI (see, Table 23).

H3b. *AGE moderates the indirect effects of CA and FS on BI.* Only moderation of the CA→EE relationship indicated a significant moderation effect for faculty under 55 years of age ($\beta = 0.540$, $p < .01$), while no significant moderating effect was observed for faculty over 55 or older ($\beta = 0.534$, $p \geq .05$). Significance was observed on moderated differences between age groups on EE→BI ($\beta_{diff} = 0.546$, $p < .01$), with younger faculty exhibiting a moderating effect ($\beta = 0.414$, $p < .01$). No significant difference was observed between moderating effects of age on FS→FC ($\beta_{diff} = 0.276$, $p \geq .05$). No additional significant findings were observed related to AGE moderated effects of CA and FS on BI (see, Table 34).

H3c. *EXP moderates the indirect effects of CA and FS on BI.* Moderation of the CA→EE, CA→PE, and FS→FC relationships indicated a significant moderation effect for

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faculty with less than 17 years teaching experience (respectively, $\beta = 0.577$, $p < .001$; $\beta = 0.589$, $p < .001$; and $\beta = 0.404$, $p < .01$), while no significant moderating effect was observed for faculty with 17 or more years of experience (respectively, $\beta = 0.159$, $p \geq .05$; $\beta = 0.319$, $p \geq .05$; and $\beta = 0.234$, $p \geq .05$). No significant difference was observed between moderating effects of experience on CA→EE, CA→PE, or FS→FC (respectively, $\beta_{diff} = 0.418$, $p \geq .05$; $\beta_{diff} = 0.270$, $p \geq .05$; and $\beta_{diff} = 0.169$, $p \geq .05$). No additional significant findings were observed related to EXP moderated effects of CA and FS on BI (see, Table 27).

Summary

The purpose of this study was to investigate the role ISP play in change agency in diffusing educational technology innovations and what role this change agency plays in individual acceptance decisions. Chapter 4 presented data and findings for an extended UTAUT model and survey including change agency and functional support provided by ISP. Measurement and structural model validity and reliability were presented along with relationship and effect statistics. The concluding chapter presents a summary of the study and findings with a discussion of those findings and recommendations are provided for practice and future research.

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CHAPTER FIVE – CONCLUSION

The purpose of this study was to investigate the influence of ISP roles on behavioral intentions of faculty to adopt educational technology, generally as, 1) whether change agents provide value in the decision process, 2) how change agency contributes to the overall acceptance of educational technology in higher education, and 3) the effect of including change agency in acceptance models. ISP roles under investigation in this study were those of change agency and functional support. The effect of change agency and function support were evaluated in the context of the UTAUT model as precursors to faculty perceptions of social influence, effort expectancy, performance expectancy, and perceptions of facilitating conditions on intention to accept educational technologies for use in academic environments. In addition to direct investigations of the research questions posed, this study provided insight to the efficacy of an extended UTAUT model involving activities outside the normally accepted social system of faculty acceptance. These areas are discussed in the context of ISP roles and applicability to extending the UTAUT model. Recommendations for practitioners and future research are included.

Roles of ISP and Influence on Faculty Intentions

In the current study, influence on faculty educational technology adoption was centered on ISPs' faculty facing roles of change agent and functional support. Both roles are important within the context of innovation diffusion (Rogers, 2003) and, in the current study, were hypothesized as being influential to faculty behavioral intent toward technology acceptance.

Change Agency Role of ISP

In the observed data, faculty perception of the ISP's role as a change agent had a positive indirect effect on faculty intention to adopt educational technologies. The effect of change

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agency was mediated by faculties' perceptions of social influence, performance expectancy, effort expectancy, and facilitating conditions. That each of the UTAUT model's latent variables were identified as mediating change agency, points to the substantial influence an ISP has functioning in the role of change agent. Positive faculty perceptions of an ISPs ability to communicate and demonstrate technology options (see, Appendix A, CA4 and CA1), communicate benefits or consequences of options (CA2 and CA3), and adapt technology options to a faculties' needs positively influence all aspects of the extended model.

Functional Support Role of ISP

In the observed data, there was no evidence to support the ISP's role as functional support as directly or indirectly influencing faculty adoption of educational technologies. However, functional support was found to have a significant relationship with facilitating conditions. These findings are intriguing in that the primary role of an ISP both in practice and as defined by preparation programs is as a support. The findings are surprising within the context of ISP functional support; however, the lack of a relationship of facilitating conditions with behavior intent has been frequently identified (Dwivedi et al., 2011; Venkatesh et al., 2003; Venkatesh et al., 2012). While beyond the scope of this study, based on findings of prior research, studies involving actual usage (beyond behavioral intent) may identify an indirect effect of functional support on usage behavior in line with prior findings of facilitating conditions direct effect on actual usage. Implying that functional support and facilitating conditions are conditions linking intention to action.

Moderated Influences by Gender, Age, and Teaching Experience

Previous studies of technology acceptance found that potential-adopter characteristics moderated the effects of various latent variables (Dwivedi et al., 2011; Venkatesh et al., 2003;

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Venkatesh et al., 2012). In the current study, there was little evidence of this phenomenon in the data. No significant differences were observed in the current study in relation to gender, age, or years of teaching experience on change agency or functional support effects. Nonsignificant differences were present in the modeled data and may allude to undetected significances given the sample. Female faculties' positive perception of functional support moderated perceptions of facilitating conditions, while males exhibited no moderating effect. Younger faculties' positive perception of change agency moderated effort expectancy, while older faculty exhibited no moderating effect. Faculty with less than 17 years of teaching experience moderated positive perceptions of change agency on effort expectancy, performance expectancy, and facilitating conditions.

Extension of UTAUT

The research conceptual framework presented in Chapter 3 (see Figure 8) guided the current research. This model was based on prior research on technology acceptance, critiques of the UTAUT model, and integration of the IDT related roles of ISP. While the majority of the established UTAUT model was retained after analysis, several relationships of the extended model used in this study did not survive. The following review outlines where the conceptual framework and resulting model, illustrated in Figure 13, diverge.

In the established UTAUT model there is a frequently established relationship between social influence and behavioral intent (Dwivedi et al., 2011). However, in the current study, statistical significance of the SI→BI relationship was not observed. It is unknown how the deviation from a long-established link between the two constructs occurred. While collinearity between CA and SI was not observed in the data, a priming effect may have occurred, influencing respondents regarding the similarities of the two influence-oriented domains.

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By the addition of a functional support construct and omission of a measure of actual usage, the researcher hypothesized that a direct relationship between facilitating conditions and behavioral intent would emerge. This belief was in conflict with prior research on the UTAUT model, which often indicated facilitating conditions exhibit a direct effect on actual usage and not behavioral intent. The hypothesized relationship was not observed in the data, thus alluding to the established model relationship – facilitating conditions effect on actual usage – being the most likely outcome. Lastly, a conceptualized relationship between functional support and effort expectancy was not statistically supported in the data

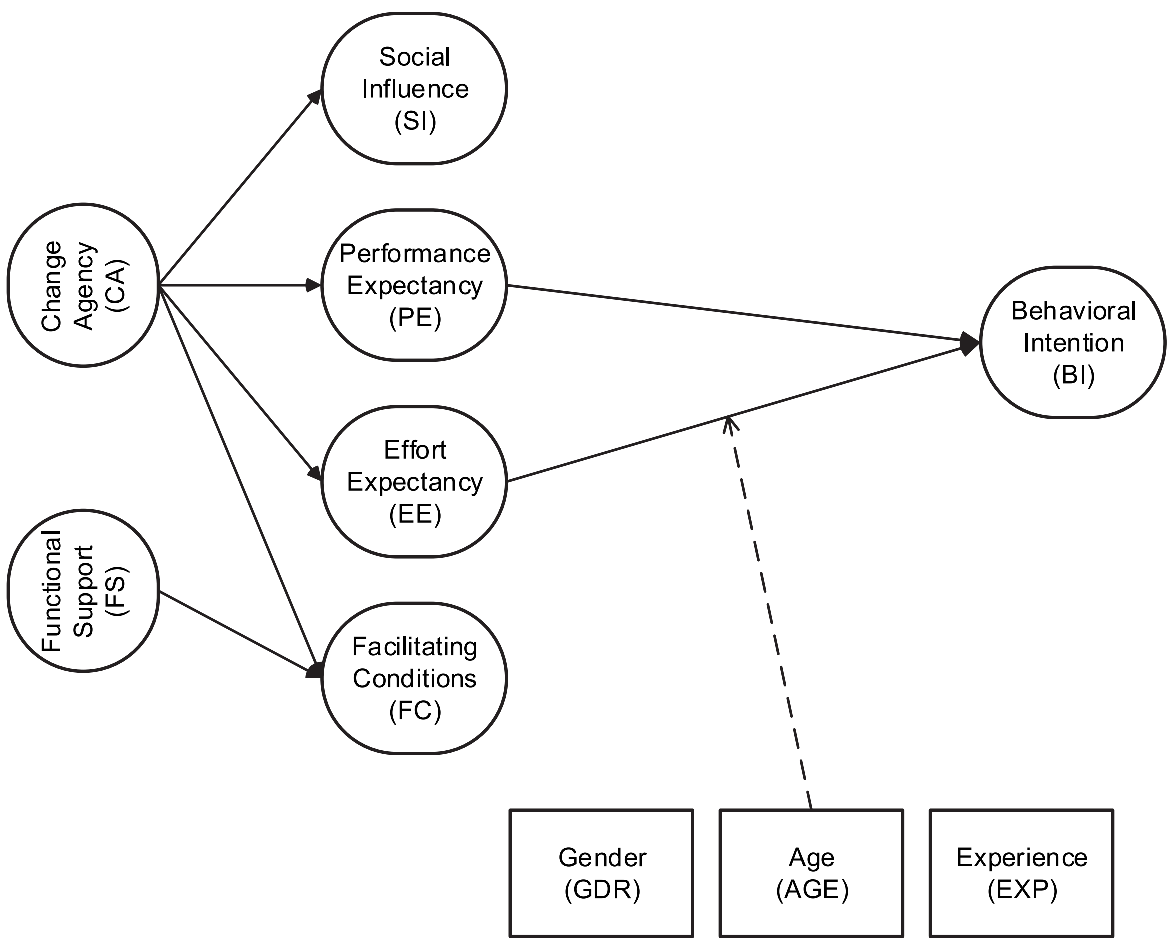

Figure 13. Final Extended UTAUT Model.

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Previous research on the UTAUT model has frequently identified moderating effects by potential-adopter or technology characteristics (e.g., age, gender, voluntariness, or experience with technology) (Dwivedi et al., 2011; Liu et al., 2017; Venkatesh et al., 2003; Venkatesh et al., 2012). In the conceptual model, the researcher identified three relevant and related characteristics which are most likely to make faculty groups heterogenous within the latent variables: gender, age, and years of teaching experience. Unlike previous research which found moderating effects on social influence, performance expectancy, effort expectancy, and facilitating conditions, the current study only observed a significant moderating effect on effort expectancy, by age. As several of the group specific analyses indicated significant effects by group, yet nonsignificant differences between groups, an inability to detect significance was likely due to low group counts.

Contributions to Theory

The current study makes several important contributions to theory. First, the findings contribute to both higher education and information science literature on technology adoption and diffusion in the context of business faculty. These contributions include identification of antecedents external to faculty adopters' internal support and social system. The successful inclusion of external factors demonstrates the influence of external agents in the decision process and provides a direct link to the wider context of diffusion. By linking UTAUT with IDT at the change agent, the study provides an opportunity expand research on acceptance to larger group or case-based technology diffusion studies.

Implication for Practice

While a body of knowledge exists regarding change agency in diffusion of innovations, no published research was focused on change agency in the context of ISP. The current study

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investigated the role of ISP in change agency in individual business faculty educational technology acceptance decisions. The findings of this research have the potential to guide faculty involved with the preparation of ISP in roles relating to change agency and administration in identifying the conditions in which ISP are capable of contributing to change efforts.

ISP Preparation and Standards

Although established standards identify the change agency related skillsets needed, there are inconsistencies between standards and discovered importance of change agency observed in the current study. As was highlighted in chapters 1 and 2, there has been a trend toward ISP placed in the role of change agent. The profession has come to recognize the importance of facilitating change and that the role of change agent is that of vision building rather than technician, yet the standards of the profession are not reflected in the appropriate experience levels, which indicate that change agency should only be expected of experienced instructional designers. As described in chapter 2, this leads to three potential misalignments: a) the change agency related standards are scoped too high in expertise, b) formal academic programs are not well aligned with the standards, or c) administration have placed too high an expectation on the profession in terms of relevant skills and experience in change agency.

The findings should be seen as a signal that professional standards should place a greater importance on preparing ISP for their role in change agency. Thus, adjustments to the level of experience expected of ISP in acquiring skillsets in change agency should be reduced from *advanced* and *managerial* level expectations to those of *essential* skills. The ability of any ISP to impact faculty decisions regarding educational technologies will be dependent on many skills currently identified as *managerial* within the IBSTPI standards, e.g., effective collaboration and

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consensus-building skills, effective negotiation and conflict resolution skills, and implementation, dissemination, and diffusion of instructional and non-instructional interventions (Koszalka et al., 2013). Significant review and adjustment of the level scope will better inform ISP preparation faculty in development of curriculum and in turn prepare ISP for their commonly expected role as change agent within higher education.

ISP Practitioners

Change agents are individuals who influence the individual or social system's innovation decisions in a direction deemed desirable by the agent (Rogers, 2003). By this definition, the role of ISP is often viewed as change agents, in addition to the essential support function they perform (Rubley, 2016). This agency can act as a diffusion mechanism and positively influence technology acceptance. ISP should embrace and develop skillsets related to effective and ineffective interactions or communication modes between, and as a mediator of, faculty, staff, and administration. These skillsets are critical to ongoing success and acceptance of the profession as an effective tool for influencing change in higher education institutions.

Institution Administration

The use of educational technologies within higher education has evolved over time – from early uses that augmented curriculum to highly integrated and inter-dependent curricula with technology at the forefront. Early on, faculty adopters were more dependent on technical assistance, or *functional supports*, than the need for agents presenting technology options. However, in the current environment of a diverse and mature ecosystem of educational technology offerings, the need for change agents has greatly increased. Higher education leadership should be more purposeful in addressing the need for change agents and embrace an understanding of the dynamics of faculty acceptance of educational technology. As the findings

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of this study has indicated, the change agent and functional support roles of ISP contribute to those faculty acceptances; however, these contributions are not equal in influence on decision making.

ISPs are placed in a conflicting position within the institution, situated between faculty and administration. Often, the ISP is viewed with a degree of distrust by faculty as pushing the agenda of administration. As described, the ISP has been traditionally viewed in the technical support role. An ISP must earn the trust of faculty to function within the role of change agent. ISPs must be able to communicate the benefits and consequences of using educational technologies and also demonstrate adaptation of those technology to faculties specific needs. These actions begin to bridge the social system gap by demonstrating that the ISP recognizes the needs of faculty and are working toward their best interests. In contrast, ISPs that are highly skilled in their field, yet only provide functional support and are dependable and skilled, do not substantially contribute to faculty intentions to adopt new educational technologies. The purposeful actions of an ISP in the role of change agent influence all aspects of faculty decision processes to adopt educational technologies or not.

In order to further innovation, administration should place importance on hiring and cultivating highly skilled ISP with successful change agent experiences and skillsets. Leadership can no longer focus just on hiring a cadre of technicians and artists and expect innovation diffusion to naturally emerge across the institution. Rather, the desire for change must be purposefully built into the initiatives and cultivated by ISP through collaboration and communication with administration and faculty. In this model, ISP become an integral mechanism for diffusion, as opposed to a foundational or technical resource called upon when

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needed. Mutual involvement and sustained communication between these three stakeholder groups will aid in lessening distrust and encouraging collaboration and agency activities.

Recommendations for Future Research

The analysis of change agency and functional support roles in this study reveal both logical continuations and interesting new areas for further study. Two primary recommendations for continued research in change agency and function support roles in the context of faculty educational technology are to reincorporate actual usage, beyond intention, and extend the model analysis to additional faculty social systems and institutional cultures. In the current study, the boundaries of analysis were those of business faculty intentions, within schools of business, and a conceptual grouping of educational technologies likely present in schools of business. These boundaries placed limitations on analysis toward specific usage and generalizability to other cultures or social systems. Future studies should focus on a given technology case from agency to actual use. By focusing on a specific educational technology diffusion, future studies would be afforded greater depth of understanding in both longitudinal and disciplinary differences both faculty and ISP encounter in agency, support, and usage.

Faculty demographic characteristic moderating in the current study provides a foundation that faculty characteristics may contribute to overall change agency and functional support outcomes. The current study did not investigate the demographic characteristics of the ISP in agency and support roles. Future research should incorporate both faculty and ISP characteristics toward an investigation of homophily/heterophily in relationships within agency and support.

The researcher has observed numerous prior studies, including the current study, extending the UTAUT, TAM, and IDT models with additional constructs in an additive or

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antecedent manner. A potential concern with this is that as new constructs are added to these models, there is a potential for creating conceptual similarities in theoretical constructs, as well as over specification. Potential overloading of conceptual similarities may lead toward *n*-order factors (e.g., second-order representation of first-order latent variables). In the current study, concern was taken regarding the conceptual similarities of change agency and social influence, both of which incorporate influence of people on a social level – one internal to the faculty social system and one external. Functional support and facilitating conditions create a similar condition whereas both are support conditions, yet one is internal and one external. The current study has established external system factors (i.e., change agency and functional support) contribute to internal system factors (i.e., social influence and facilitating conditions) as well as individual expectancy factors (i.e., performance and effort expectancy). Future research in extending the model should work toward generalizing the model for second-order effects.

Conclusion

Historical and current trends continue to suggest that technology and pedagogical innovations will rapidly transform higher education. While the successful diffusion of instructional innovations is often a desired outcome — assumed to benefit students, faculty, and administration — the process of diffusion and change agency has become a black box of expectations placed upon ISP. There has existed a substantial gap in understanding the intersection of administration, faculty, and ISP in terms of the effect of ISP change agency on technology diffusions. The current study addressed this gap in empirically identifying the effects in which faculty perceptions of ISP change agency influenced intentions to adopt educational technologies.

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Much of the ISP profession has been focused on technology and practices of the discipline, rather than the higher-order effect of the profession's interaction with other disciplines and institutional roles. This research provided insight toward the potential influence ISP have in the role of change agent in the diffusion process affecting or redirecting adoption by faculty and goals of the administration. Faculty developing curriculum in instructional support related disciplines have an obligation to prepare ISP for the potential conflicts of the change agency role they will fill in higher education and this role influences the direction of academic environments. In light of findings in the current study, the value of ISP in the context of adoption and diffusion processes has been established.

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APPENDIX A – SURVEY INSTRUMENT

Demographics:

Faculty Status: *Part-time, Full-Time Non-Tenure Track, Full-Time Tenure Track, Tenured*

Gender: *Male, Female, Transgender, Prefer not to say*

Age: *18-24, 25-34, 35-44, 45-54, 55-64, 65-74, 75 or older*

Approximate Number of years of teaching experience: *[Numeric response]*

Prior Educational Technologies Used:

Of the educational technologies listed, which have you used in your courses? (Select all that apply)

- ☐ *Authoring tools for learning materials / content (e.g., Camtasia, SoftChalk, etc.)*
- ☐ *Collaborative training tools (e.g., Collaborate, Google Docs, GoToMeeting, etc.)*
- ☐ *Devices and interfaces for Learning (e.g., Student Response Systems "Clickers")*
- ☐ *Intelligent tutors*
- ☐ *Online learning systems*
- ☐ *Personalized and adaptive learning systems*
- ☐ *Simulation systems for education and training*
- ☐ *Social networks*
- ☐ *Specialized or task-specific software*
- ☐ *Standard Desktop Software*
- ☐ *Tools assessment*
- ☐ *Video or Lecture Capture Systems*
- ☐ *Wiki's, Blogs, or other infrastructures for knowledge sharing*

Other: [Open response]

The remaining items are 5-point Likert-like scales ("strongly disagree", "disagree", "neutral", "agree", and "strongly agree"). Item sources are noted.

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Change Agency (CA):

CA1 – The instructional support professional communicated educational technology options to me. (Perez et al, 2017)

CA2 – The instructional support professional communicated the benefits of using educational technologies to me. (Moore & Benbasat, 1991)

CA3 – The instructional support professional communicated the consequences of using educational technologies to me. (Moore & Benbasat, 1991)

CA4 – The instructional support professional demonstrated the educational technologies to me. (Moore & Benbasat, 1991)

CA5 – The instructional support professional adapted the educational technology to my specific needs. (Moore & Benbasat, 1991)

CA6 – The instructional support professional encouraged me to use educational technologies in my course(s). (Perez et al, 2017)

Functional Support (FS):

FS1 – When instructional support professional promises to do something by a certain time, they do so. (Cronin & Taylor, 1992)

FS2 – When I have problems, the instructional support professional is sympathetic and reassuring. (Cronin & Taylor, 1992)

FS3 – The instructional support professional is dependable. (Cronin & Taylor, 1992)

FS4 – The instructional support professionals are always willing to help me. (Cronin & Taylor, 1992)

FS5 – The instructional support professionals have my best interests at heart. (Cronin & Taylor, 1992)

FS6 – A specific instructional support professional is available for assistance when I encounter difficulties. (Venkatesh et al, 2003)

Social Influence (SI): (All items, Venkatesh et al, 2003)

SI1 – People who influence my behavior think that I should use educational technologies in my courses.

SI2 – People who are important to me think that I should use educational technologies in my courses.

SI3 – Administration have been helpful in using educational technologies in my course.

SI4 – In general, the organization has supported the use of educational technologies in my courses.

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Performance Expectancy (PE): (All items, Venkatesh et al, 2003)

PE1 – I would find educational technologies useful in my courses.

PE2 – Using educational technologies enables me to accomplish tasks more quickly.

PE3 – Using educational technologies increases my productivity.

PE4 – If I use educational technologies, I will increase my chances of improving my courses.

Effort Expectancy (EE): (All items, Venkatesh et al, 2003)

EE1 – My interaction with the educational technologies would be clear and understandable.

EE2 – It would be easy for me to become skillful at using educational technologies.

EE3 – I would find educational technologies easy to use.

EE4 – Learning to operate the technologies is easy for me.

Facilitating Conditions (FC): (All items, Venkatesh et al, 2003)

FC1 – I have the resources necessary to use educational technologies.

FC2 – I have the knowledge necessary to use the educational technologies.

FC3 – The educational technologies are compatible with other systems I use.

FC4 – A specific peer is available for assistance when I encounter difficulties.

Behavioral Intent (BI): (All items, Venkatesh et al, 2003)

BI1 – I intend to use educational technologies next semester.

BI2 – I plan to use educational technologies in the current academic year.

BI3 – I predict I would use educational technologies in the next academic year.

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APPENDIX B – QUESTIONNAIRE

Desktop View of Study Questionnaire

Introduction

Educational Technology Faculty Acceptance Study

Consent to Participate in Study

Purpose of the study: This study is being conducted by R. Wayne Jones in the Higher Education Faculty Leadership program in the College of Education and Health Professions at the University of Arkansas-Little Rock in order to in order to better understand the role of instructional support professionals (ISP) on the educational technology decision making process of faculty. This research will help faculty, administrators, and ISP to better understand the effect of ISP in academic environments.

Survey procedures and approximate duration: I would greatly appreciate your completing the following web-based survey. Since the validity of the results depend on obtaining a high response rate, your participation is crucial to the success of this study. The survey which will focus on your experiences in educational technology adoptions will take approximately 12 minutes to complete.

Confidentiality and the limits to these assurances: By selecting the affirmative option below, you consent to participate in this study. Please be assured that your responses will be held in the strictest confidence. Taking part in this study is completely voluntary. If you choose to be in the study you can withdraw at any time by exiting the survey. Prior to final submission of the survey, you will once again be given the explicit option to withdraw. Your responses will be kept strictly confidential, and digital data will be stored in secure computer files. Any report of this research that is made available to the public will not include any individual information by which you could be identified

Anticipated risks, discomfort, and benefits resulting from this study: There are no known risks or discomforts associated with this survey, beyond what is normally experienced interacting with a computer or mobile device.

The potential benefits to science and humanity that may result from this study are an improved understanding of how collaboration of faculty, administration, and ISP affect the academic environment. Respondents will have the opportunity to receive feedback regarding the study results once published in ProQuest. Respondents or interested parties who wish to be notified upon publishing may email the principle investigator to notify when published.

Additionally, as a personal benefit, for every 50 participants, a $25 gift card to Amazon, iTunes, or Starbucks will be awarded randomly to participants who have opted-in, by drawing at the completion of the study (e.g., 165 participants = 3 x gift cards drawn). Up to 4 gift cards will be available for award. At the completion of the research survey, you will be given the option to opt-in to the gift card drawing. This opt-in will redirect you to a separate secured survey to collect individually identifiable information and choice of card, necessary to transmit a gift card to you in the event you are selected in the drawing. Opt-in information will not be linked in any way to your responses.

Contact information: If you have any questions about this study, you can contact the person(s) below:

R. Wayne Jones
Dir., Evaluation and Outcomes
Sam M. Walton College of Business
University of Arkansas
220 N. McIlroy, Ave. RCED 208
Fayetteville, AR 72701-1201
(479) 575-6225
wjones@walton.uark.edu

Jim Vander Putten, Faculty Advisor
Department of Educational Leadership
College of Education and Health Professions
University of Arkansas-Little Rock
2801 S. University Ave.
Little Rock, AR 72204-1099
(501) 569-3549
jvputten@ualr.edu

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This study has been reviewed and approved by The University of Arkansas-Little Rock's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions regarding your rights as a research subject, please contact Research Compliance Officer at 501-569-8657 or irb@ualr.edu.

Please feel free to print or download a copy of this consent page to keep for your records, by clicking here: **ETAS Consent.pdf**.

I hope that you will be able to participate in this study.

I choose **to participate**.

I choose **not to participate**.

Age

What is your age?

18 - 24

25 - 34

35 - 44

45 - 54

55 - 64

65 - 74

75 or older

<<   >>

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Gender

What is your gender?

- Male
- Female
- Transgender
- Prefer not to say

<< >>

Faculty Status

Faculty Status

- Part-time
- Full-time Non-Tenure Track
- Full-time Tenure Track
- Tenured

>>

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Teaching Experience

Approximate number of years of teaching experience

<<

>>

Prior Educational Technology Usage

Of the educational technologies listed, which have you used in your courses? (Select all that apply)

- Authoring tools for learning materials / content (e.g., Camtasia, SoftChalk, etc.)
- Collaborative training tools (e.g., Collaborate, Google Docs, GoToMeeting, etc.)
- Devices and interfaces for Learning (e.g., Student Response Systems "Clickers")
- Intelligent tutors
- Online learning systems
- Personalized and adaptive learning systems
- Simulation systems for education and training
- Social networks
- Specialized or task-specific software

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Standard Desktop Software

Tools assessment

Video or Lecture Capture Systems

Wiki's, Blogs, or other infrastructures for knowledge sharing

Other

<<

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ISP Branch Check

Throughout this survey, the term *Instructional Support Professional*, or ISP, refers to professionals tasked with supporting faculty in educational technologies. These professionals are commonly referred to as *instructional designers*, *academic technologists*, *e-learning developers*, *instructional systems designers*, or *media specialists*; however in your organization they may go by another title.

Regardless of the title, the role of these professionals includes assisting you, or groups of faculty, in developing your courses using technologies or responding to support requests you have regarding technologies used in your courses.

Have you worked with an ISP to develop, "improve", or redesign a course?

Yes

No

<<

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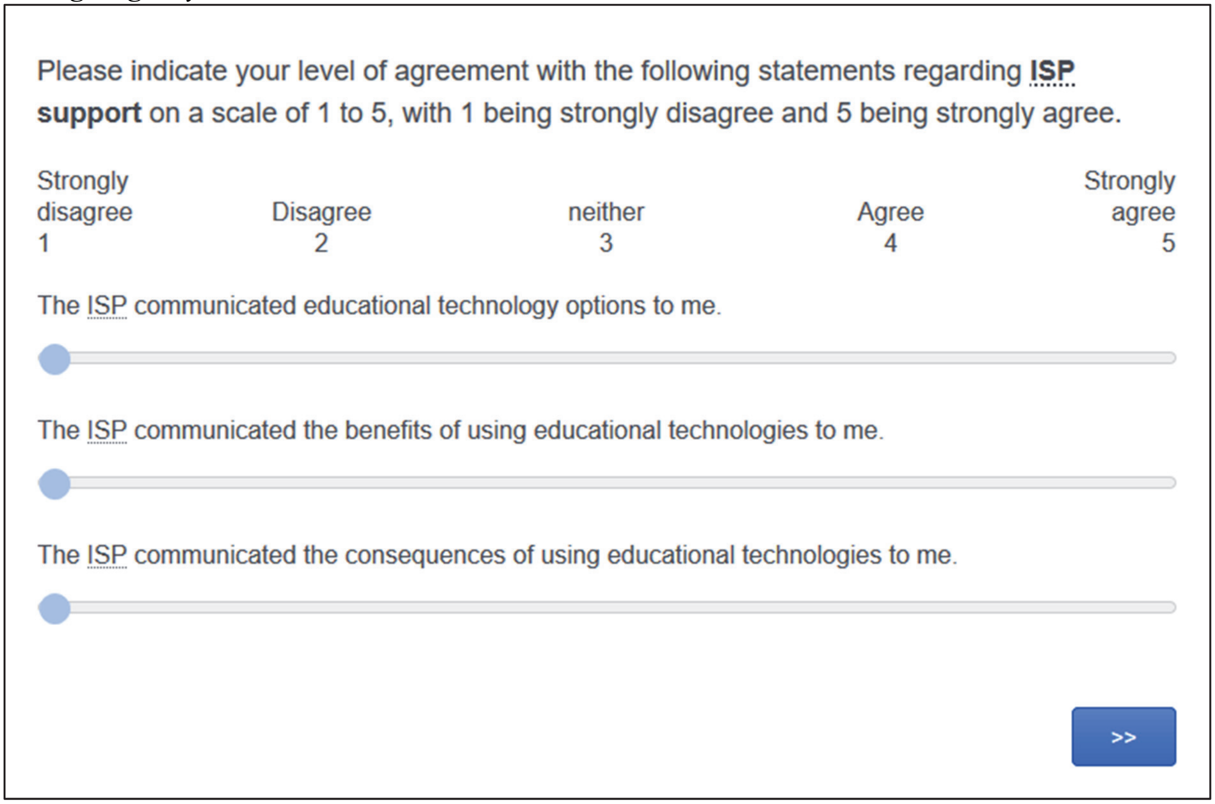
Change Agency 1-3 and 4-6



Please indicate your level of agreement with the following statements regarding **ISP support** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

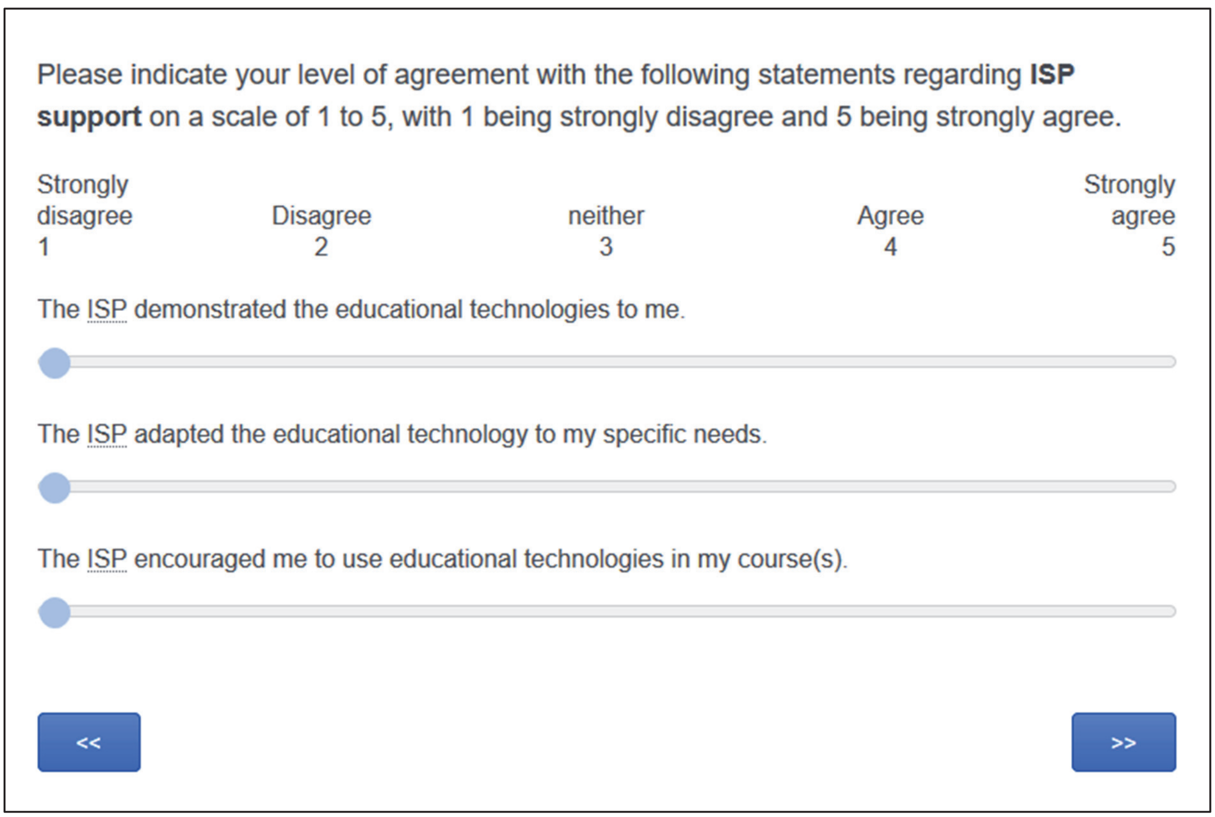
Strongly disagree	Disagree	neither	Agree	Strongly agree
1	2	3	4	5

The ISP communicated educational technology options to me.

The ISP communicated the benefits of using educational technologies to me.

The ISP communicated the consequences of using educational technologies to me.

>>



Please indicate your level of agreement with the following statements regarding **ISP support** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree	Disagree	neither	Agree	Strongly agree
1	2	3	4	5

The ISP demonstrated the educational technologies to me.

The ISP adapted the educational technology to my specific needs.

The ISP encouraged me to use educational technologies in my course(s).

<< >>

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Functional Support 1-3 and 4-6

Please indicate your level of agreement with the following statements regarding **ISP support** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree 1	Disagree 2	neither 3	Agree 4	Stronly agree 5

When the ISP promises to do something by a certain time, they do so.

When I have problems, the ISP is sympathetic and reassuring.

The ISP is dependable.

<< >>

Please indicate your level of agreement with the following statements regarding **ISP support** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree 1	Disagree 2	neither 3	Agree 4	Strongly Agree 5

The ISP are always willing to help me.

The ISP have my best interests at heart.

A specific ISP is available for assistance when I encounter difficulties.

<< >>

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Social Influence

Please indicate your level of agreement with the following statements regarding **general influence** on a of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree	Disagree	neither	Agree	Strongly agree
1	2	3	4	5

People who influence my behavior think that I should use educational technologies in my courses.

People who are important to me think that I should use educational technologies in my courses.

Administration have been helpful in using educational technologies in my course.

In general, the organization has supported the use of educational technologies in my courses.

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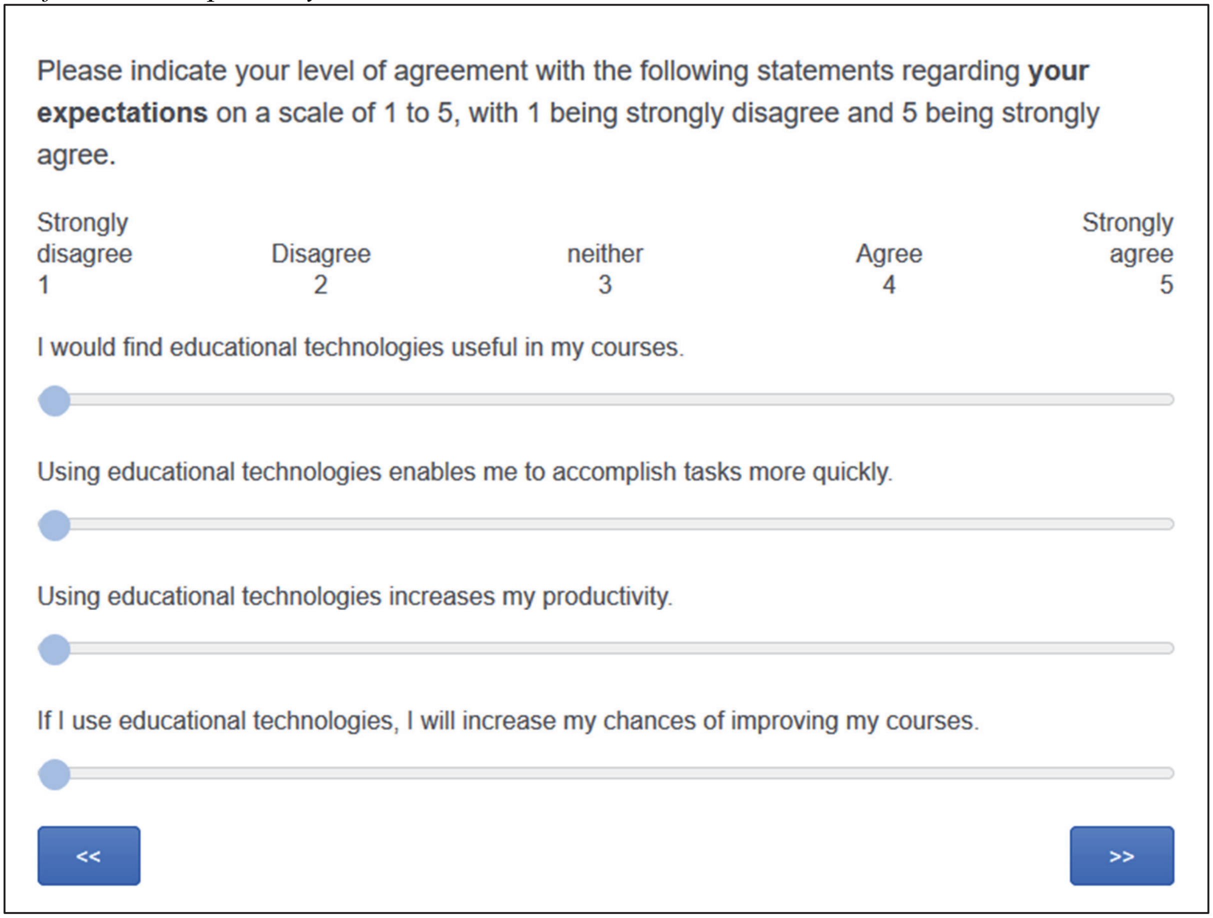
Performance Expectancy



Please indicate your level of agreement with the following statements regarding **your expectations** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree	Disagree	neither	Agree	Strongly agree
1	2	3	4	5

I would find educational technologies useful in my courses.

Using educational technologies enables me to accomplish tasks more quickly.

Using educational technologies increases my productivity.

If I use educational technologies, I will increase my chances of improving my courses.

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Effort Expectancy

Please indicate your level of agreement with the following statements regarding **your expectations** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree	Disagree	neither	Agree	Somewhat agree
1	2	3	4	5

My interaction with the educational technologies would be clear and understandable.

It would be easy for me to become skillful at using educational technologies.

I would find educational technologies easy to use.

Learning to operate these technologies is easy for me.

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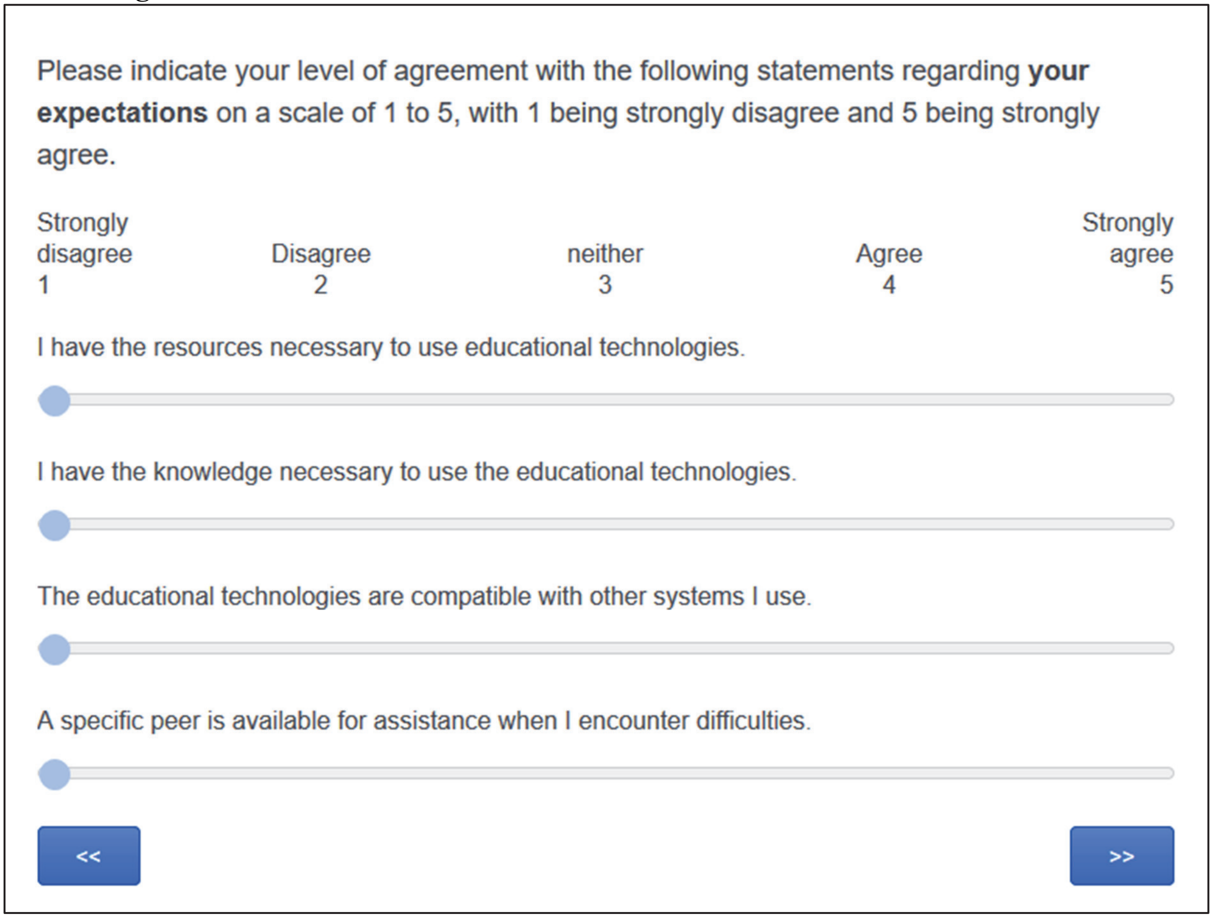
Facilitating Conditions



Please indicate your level of agreement with the following statements regarding **your expectations** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree	Disagree	neither	Agree	Strongly agree
1	2	3	4	5

I have the resources necessary to use educational technologies.

I have the knowledge necessary to use the educational technologies.

The educational technologies are compatible with other systems I use.

A specific peer is available for assistance when I encounter difficulties.

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Behavioral Intent

Please indicate your level of agreement with the following statements regarding **your intentions toward educational technologies** on a scale of 1 to 5, with 1 being strongly disagree and 5 being strongly agree.

Strongly disagree 1	Disagree 2	neither 3	Agree 4	Strongly agree 5

I intend to use educational technologies next semester.

I plan to use educational technologies in the current academic year.

I predict I would use the educational technologies in the next academic year and/or beyond.

I have no intention to use educational technologies.

<< >>

Participation Confirmation

By clicking the next button, you will have competed the survey.
If you would like to withdraw from the survey (revoke consent to participate), select the *withdraw* option below.

I wish to continue with the survey.

I wish to withdraw from the survey and remove all my responses.

<< >>

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Submission and Opt-In Link

Thank you for completing the survey! Your responses are highly valued.

Thank you for participating in the research survey. As a benefit of participating, the researcher has funded up to four $25 gift cards to be awarded to randomly selected participants. For each 50 participants in the study, one participant will be randomly selected. Gift cards will be delivered electronically via email, directly from the retailers. To receive an e-gift card you will need to provide your name, email address, and select the retailer. Selected participants will receive an email on December 1st, 2017 as notification and verification of email addresses. Electronic delivery will occur after email addresses are verified.

If you would like to be included in the drawing, click the **opt-in** link below to be redirected to a separate survey. For confidentiality, your survey responses will be maintained separately from the drawing opt-in information. Please note, by opting in to the drawing, complete anonymity cannot be ensured, as only respondents to the survey can be included in the drawing.

The following link can only be clicked once and is restricted to this page.

I would like to **opt-in** to the drawing.

I do not wish to participate in the drawing.

Fully Withdrawn or Non-Participating

Your request to withdraw from the study has been processed. All survey responses have been removed. Please close this survey to exit.

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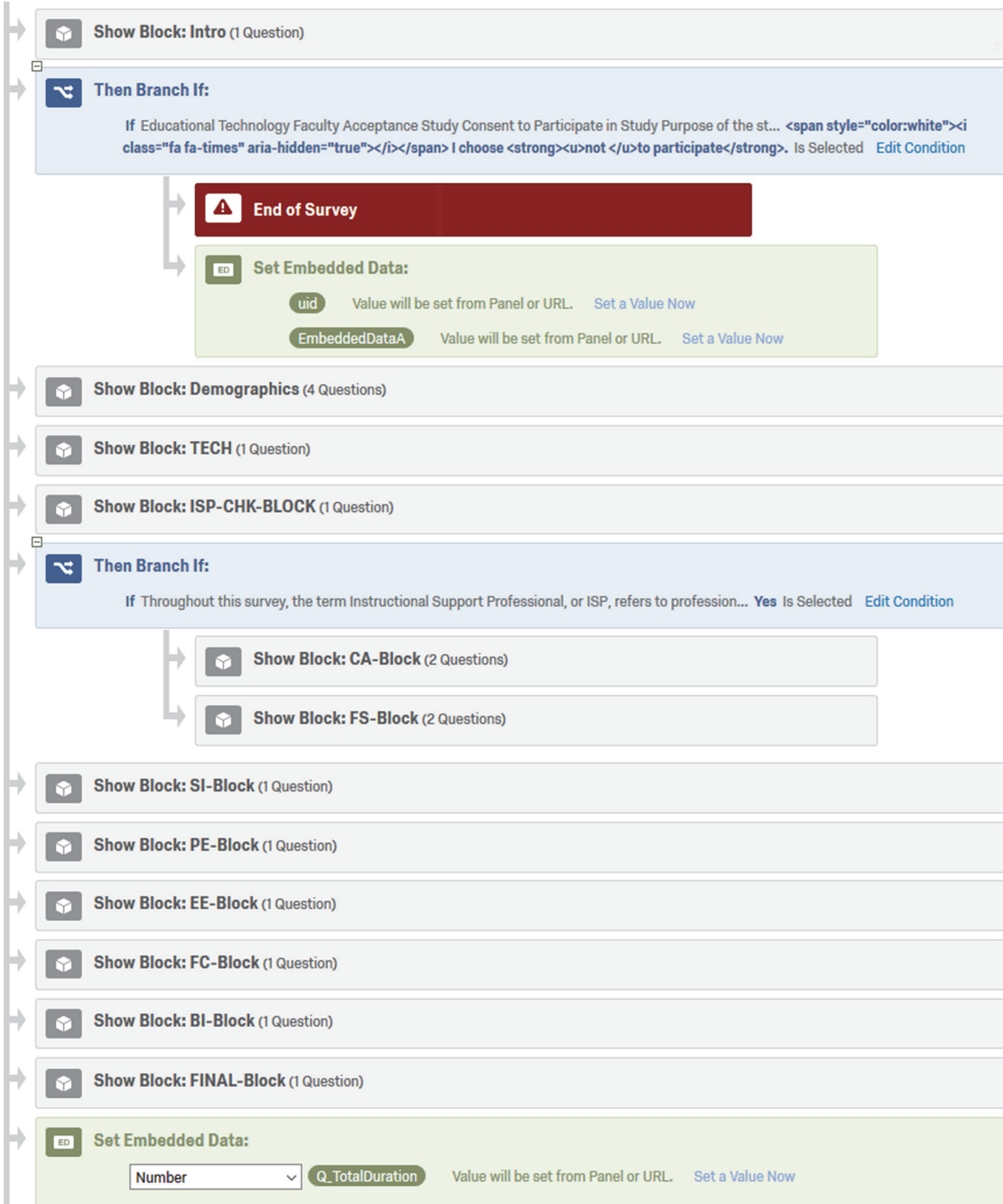
Study Questionnaire Flow Logic



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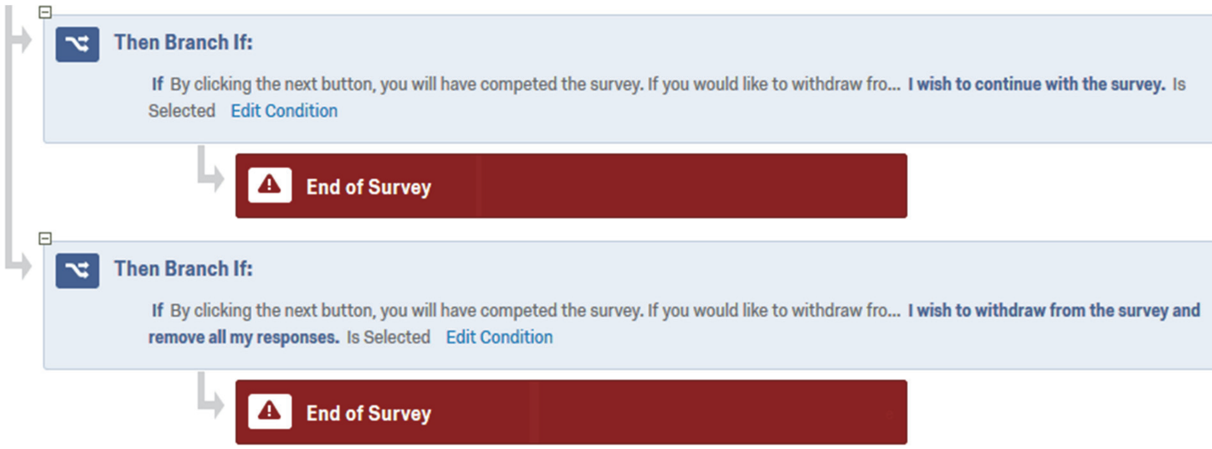

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Drawing Opt-in Questionnaire

Educational Technology Faculty Acceptance Study
Survey Drawing Opt-In

Thank you for participating in the research survey. As a benefit of participating, the researcher has funded up to four $25 gift cards to be awarded to randomly selected participants. The random selection will occur on **December 1st, 2017** (in time for extra holiday purchases).

For each 50 participants in the study, one participant will be randomly selected. *For example, if there are 175 participants, three cards will be awarded. Over 200 participants will result in all four cards being awarded to random participants. Overall number of participants who opt-in to the drawing will not impact the number of cards available.*

Gift cards will be delivered electronically via email, directly from the retailers. To receive an e-gift card you will need to provide your name, email address, and select the retailer. **Selected participants will receive an email on December 1st, 2017 as notification and verification of email addresses. Electronic delivery will occur after email addresses are verified.**

Please complete the following information to opt-in to the random drawing.

First Name:

Last Name:

eMail Address to Receive Card:

Re-type eMail address for verification:

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Winners of the $25 gift cards choose the card retailer.

***If you are chosen as the winner of a gift card*, which of the following is your choice?**

Amazon

Starbucks

Apple iTunes

Best Buy

eGifter Choice Card [The eGifter Choice Card can be used to "buy" gift cards of your choice listed on the eGifter.com website. eGifter lists over 250 brands to choose from.]

Submit

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APPENDIX C – RECRUITMENT AND REMINDER CORRESPONDENCE

Part 1 - Senior Associate Dean Initial Email Correspondence

[TITLE] [LASTNAME],

I hope that your Fall semester is off to a great start. I am writing to ask a favor. At many business colleges, there are efforts to innovate in the area of education technology. Often these efforts are supported by college or campus instructional design and support groups, but Deans sometimes struggle with determining the effectiveness of instructional design efforts.

One of our excellent staff members here in the Walton College (Wayne Jones) is conducting research on this topic for his dissertation. He will be surveying faculty at AACSB-accredited schools of business. I am hoping that you will forward the survey invitation (which you will receive shortly) to your faculty distribution list and encourage participation in the study.

Thank you in advance for the integral part you will play in this importation research. I am sure the outcome will be of interest to your institutions as it will be to the Sam M. Walton College of Business.

Sincerely,
Anne

Anne M. O'Leary-Kelly
Senior Associate Dean
William R. & Cacilia Howard Chair in Management
Sam M. Walton College of Business
University of Arkansas

Part 2 – Researcher Survey Request for Forwarding Email Correspondence

[TITLE] [LASTNAME],

My name is Wayne Jones and I am the Director of Evaluation and Outcomes at the Sam M. Walton College of Business at the University of Arkansas, as well as a doctoral candidate at the University of Arkansas at Little Rock. I am conducting research on the roles of instructional support professionals (e.g., instructional designers, education technology specialist, and similar positions) in the context of faculty decisions to adopt educational technology in their courses. Often an assumption is made that these support professionals take on the role of change agents in advocating and diffusing educational technologies. This research will empirically investigate this role in the context of faculty technology adoption at AACSB-accredited business schools.

[SCHOOLNAME] was randomly selected, along with 74 other public and private schools of business. I request that you forward this invitation to participate to your faculty distribution list. Responses of faculty who have both interacted with instructional support professionals and those whom have not are both of interest in this research.

Participation is voluntary, confidential, and will involve faculty completing an online survey estimated to take 12 minutes. Faculty who complete the survey will also have the opportunity to opt-in to a drawing for one of up-to four $25 gift-cards, as described in the introductory screen of the survey.

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Educational Technology Faculty Acceptance Study
https://[SURVEYLINK]&k=[UID]

Respectfully,
R. Wayne Jones
Doctoral Candidate
Department of Educational Leadership
University of Arkansas at Little Rock
and
Director, Evaluation and Outcomes
Office for Strategic Information and Effectiveness
Sam M. Walton College of Business
University of Arkansas

Part 3 - Researcher Survey First Reminder Email Correspondence

[TITLE] [LASTNAME],

I am following up on an email a two weeks ago, inviting your faculty to participate in AACSB related research. I am conducting research on the roles of instructional support professionals in the context of faculty decisions to adopt educational technology in their courses. [SCHOOLNAME] was randomly selected, along with 74 other public and private schools of business and the views of your faculty are important.

I request that you forward this invitation to participate to your faculty distribution list. Responses of faculty who have both interacted with instructional support professionals and those whom have not are both of interest in this research.

Participation is voluntary, confidential, and will involve faculty completing an online survey estimated to take 12 minutes. Faculty who complete the survey will also have the opportunity to opt-in to a drawing for one of up-to four $25 gift-cards, as described in the introductory screen of the survey.

Educational Technology Faculty Acceptance Study
https://[SURVEYLINK]&k=[UID]

Respectfully,
R. Wayne Jones
Doctoral Candidate
Department of Educational Leadership
University of Arkansas at Little Rock
and
Director, Evaluation and Outcomes
Office for Strategic Information and Effectiveness
Sam M. Walton College of Business
University of Arkansas

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Part 4 - Senior Associate Dean Final Reminder Email Correspondence

[TITLE] [LASTNAME],

A few weeks ago, I sent you an email requesting your support in forwarding a research survey request. As you may recall this research relates to instructional design in AACSB colleges of business, and I asked if you would be willing to forward this to your faculty.

If you have not already done so, please forward the survey invitation you will receive shortly, to your faculty distribution list. Thanks so much for your assistance.

Sincerely,
Anne M. O'Leary-Kelly
Senior Associate Dean
William R. & Cacilia Howard Chair in Management
Sam M. Walton College of Business
University of Arkansas

Part 5 - Researcher Survey Final Reminder Email Correspondence

[TITLE] [LASTNAME],

I am following up on an email a few weeks ago, inviting your faculty to participate in AACSB related research. I am conducting research on the roles of instructional support professionals in the context of faculty decisions to adopt educational technology in their courses.

The survey will close in the coming weeks; however, the views of your faculty are important. I request that you forward this invitation to participate to your faculty distribution list. Responses of faculty who have both interacted with instructional support professionals and those whom have not are both of interest in this research.

Participation is voluntary, confidential, and will involve faculty completing an online survey estimated to take 12 minutes. Faculty who complete the survey will also have the opportunity to opt-in to a drawing for one of up-to four $25 gift-cards, as described in the introductory screen of the survey.

Educational Technology Faculty Acceptance Study
https://[SURVEYLINK]&k=[UID]

Respectfully,
R. Wayne Jones
Doctoral Candidate
Department of Educational Leadership
University of Arkansas at Little Rock
and
Director, Evaluation and Outcomes
Office for Strategic Information and Effectiveness
Sam M. Walton College of Business
University of Arkansas

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