May 2017

# Agility Within Higher Education It Organizations: a Loosely Coupled Systems Perspective

Thomas E. Bunton
*University of Wisconsin-Milwaukee*

# AGILITY WITHIN HIGHER EDUCATION IT ORGANIZATIONS: A LOOSELY COUPLED SYSTEMS PERSPECTIVE

by

Thomas E. Bunton

A Dissertation Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

in Communication

at

The University of Wisconsin-Milwaukee

May 2017

ABSTRACT

AGILITY WITHIN HIGHER EDUCATION IT ORGANIZATIONS: A LOOSELY COUPLED SYSTEMS PERSPECTIVE

by

Thomas E. Bunton

The University of Wisconsin-Milwaukee, 2017
Under the Supervision of Professor Erin Ruppel, Ph.D.

This dissertation examines how leadership focus on innovation and organizational centralization relate with organizational agility, speed of technology adoption, and defined governance processes and technology standards. The study used data from the 2015 Educause survey of higher education IT organizations ($N = 822$). A five-component framework of organizational agility was identified via factor analysis and subsequently used to evaluate relationships between study variables. Findings reveal that leadership focus on innovation was statistically significant in predicting all five identified components of organizational agility, the speed of technology adoption, and the adoption of defined governance standards, reinforcing the perspective that communication is critically important in supporting the organizational agility concepts of sensing and responding. Additionally, despite existing theoretical perspectives, the study provided no supporting evidence that organizational centralization was related to organizational agility, the speed of technology adoption, nor the adoption of defined governance processes and technology standards. Lastly, the findings reveal that leadership focus on innovation is not negatively related to organizational centralization as initially theorized, but the relationship is actually positive. This positive finding between leadership focus on innovation and organizational centralization provides partial support for the perceived IT paradox.

*Keywords: organizational agility, innovation, technology adoption, loosely coupled systems*

Dedicated to my parents, for the sacrifices they made that allowed me to follow a dream of higher education, one that has now spanned several states, to my brother, whose interest in technology provided the family our first PC and years later a computer that I was fortunate enough to take to campus, to my wonderful wife Lisa, for the tremendous support throughout this journey, and to the extended family, who has always been supportive.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

This journey would not have been possible without the assistance of several key individuals and I owe a great amount of credit and gratitude to those who assisted along the way. First and foremost, a very special thanks to Leah Lang, Director of Analytics Services at Educause, and the network of Educause members around the globe who annually collect and report institutional data, which was instrumental in this study.

Second, this journey started because amazing individuals at Purdue University encouraged, supported, and ultimately accepted me as a doctoral student. Much appreciation goes to Professor Jeff Brewer who has shown to be a tremendous educator, committee chair, and mentor. Additional recognition goes to Dr. Mihaela Vorvoreanu, Dr. James Mohler, and especially Dr. John Springer, who was my original major advisor when I started as a doctoral student.

Third, I owe a sincere thank you to Dr. David Stack who took an interest in my research shortly after my transition to the University of Wisconsin – Milwaukee. His unwavering encouragement that my research interests closely aligned with those of Dr. Katy Fonner was instrumental in ultimately connecting both of us. Dr. John Jordan also deserves special thanks for his willingness to chat about the program early in my tenure and for his continued encouragement as I've progressed. Additionally, special thanks to Dr. Michelle Fetherston, an amazing peer mentor, scholar, and friend.

Fourth, I'm tremendously appreciative of the incredible faculty at the University of Wisconsin – Milwaukee and particularly the members of my committee. Dr. Jacques Du Plessis, who has been a wonderful influence on this journey and additionally a brilliant mentor and leader. Dr. Lindsay Timmerman, who provided countless suggestions and patient feedback to

improve the manuscript and ultimately make me a better writer. Dr. Erik Timmerman, who was instrumental in providing methodological support and suggestions along with recommending key theoretical principles. Dr. Katy Fonner, who was my original doctoral advisor at UW – Milwaukee, and yet despite taking a job away from campus, has continued with me on this journey. Her dedication to teaching, research, and student success is second to none and I'm forever grateful to have had the opportunity to study under and learn from her. Several of the key methodological approaches used in this study were gleaned from her expertise and patient instruction early in my career. Lastly, I owe an incredible amount of gratitude, appreciation, and admiration to Dr. Erin Ruppel. When she agreed to take over as my major advisor, I promised I would do my very best to respect her time and carefully manage requests of her expertise. Although I hope I held true to those commitments, the time and energy she's dedicated has been tremendous and beyond anything I could have imagined. Dr. Ruppel has demonstrated she is an excellent faculty member, methodologist, mediator, editor, and mentor. I am extremely fortunate to have studied under someone so brilliant and devoted.

Lastly, but certainly not least, I am forever grateful to the amazing group of very talented and dedicated individuals that I have been honored to work alongside as I've navigated this journey. I've had the tremendous privilege of working with some of the smartest leaders and evangelists in the higher education field while at the same time leading various teams of technologists who have not only been responsible for revolutionizing technology, but also radically changing the way in which technology is delivered as well. Their expertise, interest, and friendship throughout this journey is very much appreciated.

**Agility within higher education IT organizations: A loosely coupled systems perspective**

Organizations are facing profound challenges in market competition, technological innovation, and customer demand due to increasing global scale, accelerated rates of innovation, and rapid change (Tseng & Lin, 2011). Positioning an organization for future success involves effectively addressing organizational hurdles in order to create responsive structures that react to individual business unit needs while efficiently leveraging opportunities for scale. This reconceptualization of organizational structures requires an enhanced understanding of how structures and processes in organizations are created, maintained, and changed (Lewis & Seibold, 1998). Although organizational scholars have acknowledged the importance of communication change processes from the perspective of invention, design, adoption, and responses, communication scholars have long been noticeably silent in the area of organizational change literature (Lewis & Siebold, 1998). However, the application of systems thinking within organizational structures provides researchers one such framework for more completely understanding the various interactions between organizational components, their feedback processes, linear and non-linear relationships, associated timing, and related boundaries and challenges (Sweeny & Sterman, 2000).

The market competition and need for radical change are just as profound and significant for higher education organizations. The recent introduction of competency-based education has radically altered the business model that has successfully existed for decades in the higher education environment. The increased focus on student outcomes, degree completion, cost management, and overall relevancy of degrees and sustainability of curriculum, combined with new state and country campus rating systems (Ebersole, 2015) have forced leaders at all levels of higher education organizations to achieve more with fewer resources and in shorter amounts of

time. The immense rates of change, organizational demands, and financial constraints are placing tremendous amounts of pressure on higher education Information Technology (IT) leaders and organizations to become key drivers of campus success within an organizational environment that is typically fractured and decentralized.

It is no surprise that the number one challenge facing CIOs and IT leaders in 2015 was the ability to address the growing need for agility within their organizations (Stangarone, 2014). This is no different for higher education IT leaders, whose number one issue in 2016 was the ability to develop agile approaches to information security, while differentiating, reinvesting, and divesting campus-wide IT resources (Grajek, 2016). Unlike the stable IT environments of the early days of technology inception, where single IT departments were focused on integrating core business functionality on a monolithic IT system, a shift occurred in the 1980s that began to change IT from a core organizational offering to one that operates as business within a business (Boynton & Zmud, 1987). This shift not only diversified and distributed IT resources throughout the organization, but technology uses and acquisition as well. Line and staff managers were empowered to evaluate, select, procure, and deploy single-purpose IT applications within their distinct business units. During this time, many organizational units created their own IT departments because it was perceived as less expensive and less difficult to use. These distributed IT organizations traditionally implemented narrowly focused and subunit-dependent business line IT applications while ignoring the coordination costs between various other business units. This IT economy, or internal free market system of technology procurement, can be best defined as a loosely-coupled system (Weick, 1976) whereby centralized technology is required for effective organizational direction and coordination, but at the same time subunit IT

discretion and control is critical for agile local information processing needs (Boynton & Zmud, 1987).

The bottom line is that neither an IT monopoly nor complete business unit control of IT resources and direction is the appropriate course for organizational success (Boynton & Zmud, 1987), but a more balanced approach to managing IT resources is required. Core IT organizations must shift their focus from solely maintaining and supporting core applications to include the innovation and adoption of new technologies, effectively positioning the IT organization as a profit center, with a focus on driving the businesses forward (Stangarone, 2014). The suitable IT organization should support an increasingly complex business model yet effectively respond to organizational changes with great agility while reducing costs (Kastrul, 2008). These goals are just as important for higher education IT leaders. However, beyond the hypothetical adoption of new technologies and steadfast focus on technological innovation, little is understood about organizational agility because of mixed theoretical and prescriptive debate that ensues surrounding the conceptually young nature of agility (Rigby, Day, Forrester, & Burnett, 2000) and the various "black boxes" of processing between various inputs and outputs (Luhmann, 2013).

Exploring agility in higher education IT organizations within a systems framework perspective is valuable for three primary reasons. First, systems theory enables the exploration of the various relationships, management approaches, and communication processes that exist within the often highly decentralized and fragmented nature of higher education organizations. Second, systems theory provides a framework for understanding the interconnectedness and boundaries between organizations and technology, in particular during times of rapid transformation occurring in higher education institutions as they attempt to re-conceptualize

operating structures and technologies. Lastly, systems theory conceptualizes the feedback mechanisms that occur between sensing and responding, a critical step in understanding and reacting to the various market changes rapidly occurring in the higher education space.

The purpose of this research is to explore organizational agility within higher education IT environments through a loosely coupled systems theory perspective. The dissertation outlines and reviews two fundamentally important theoretical concepts. First, the dissertation describes the theoretical model of systems theory, which hypothesizes that organizations that achieve a close alignment between organizational strategy and design have the ability to optimize the total system rather than sub-optimization (Moon & Kim, 2005) by effectively continuously managing change with their ability to assess, make sense, mobilize, and redeploy resources (McCann, 2004). Second, the dissertation defines and reviews the theory of loosely coupled systems. Loosely coupled systems are structures formed with fractured internal and external environments, which makes them fundamentally difficult to coordinate actions with results (Orton & Weick, 1990). Loosely coupled systems provide the organizational advantage of enabling autonomy within an environment that balances the centralization of control with the independence needed to carry out change (Marcus, 1988).

Within the loosely coupled system framework, the dissertation explores organizational agility and evaluates the relationships that organizational agility has with two critically important interrelated concepts. The first concept explores the relationship organizational centralization has with the amount of agility that exists across the organization, the speed of technology adoption, and the adoption of defined governance processes and technology standards. The second concept explores the relationships that exist between leadership focus on innovation and those same three key elements: amount of agility that exists across the organization, the speed of

technology adoption, and the adoption of defined governance processes and technology standards. Additionally, the relationships between organizational centralization and leadership focus on innovation will be explored.

## Literature Review

This dissertation explores the relationships that leadership focus on innovation and organizational centralization have with three critically important concepts: organizational agility, speed of technology adoption, and defined governance processes and technology standards. The study will adopt a systems theory framework, specifically a loosely coupled systems perspective. Within these theoretical frameworks, organizational agility is explored in depth. First, the relationships that leadership focus on innovation and organizational centralization have with organizational agility, speed of technology adoption, and defined governance processes and technology standards will be explored. Second, the relationships that exist between these two higher level concepts, leadership focus on innovation and organizational centralization, will be examined.

Exploring agility in higher education IT organizations within a systems framework is valuable for three primary reasons. First, because of the highly decentralized and often fragmented nature of higher education organizations, CIOs and IT leaders need to critically rely on relationships, management approaches, and communication processes to empower successful organizational change. Existing organizational social networks can permit even minor decisions made at the individual or small group level to have a broader impact than what was originally intended (Granovetter, 1985), ultimately requiring wide-ranging socialization of any new strategy to successfully effect change across the organization (Lewis & Seibold, 1998). Existing organizational social systems that facilitate present day collaboration, even those that are

potentially ineffective, can powerfully maintain prevailing collectively held norms and principles of information exchange, mutual understanding, and role expectations (Rigby et al., 2000). Furthermore, divergent goals are not always best resolved by consensus, but through well thought out communication and relationship strategies that manage differences (Eisenberg, 1984) with the goal of creating maximum individuality within maximum conformity (Kant as cited in Becker, 1968). Strong leadership is needed to unify goals and clarify technology strategy (Murphy & Hallinger, 1984) while creating a shared vision of change and commitment (Lewis & Seibold, 1998).

Systems theory provides an approach for the examination of these social components and their relationships to various business processes, such as internal business functions and organizational decision making strategies. From an organizational exploration perspective, systems theory offers researchers and practitioners a framework for exploring the relationships between various business components and processes. The exploration invariably involves identifying a complex set of subjective interactions and multifaceted conceptualizations of organizational interactions, which provide guidance and control of physical and social relationships (Rigby et al., 2000) that may otherwise be difficult to explore. These relationships can range from power and control affiliations that politicize the environment, enabling and spawning decision maker alliances (Thompson & McHugh, 2003), to bargaining and negotiating with indirect employees to permit relationship building and influence (Reed, 1986). Simply put, no new strategy, no matter how much agreement the stakeholders have, stands a chance of being implemented fully without someone of power driving it (Kanter, 1983), and understanding the relationships that exist between these organizational components is crucial. From a practical perspective, IT leaders must develop and maintain appropriate communication, along with data

architectures, for both facilitating and integrating the entire organization's IT products and services while maintaining the IT related relationships among influential actors (Boynton & Zmud, 1987). Effective IT leaders must successfully build consensus among subunits regarding the role of IT within each organizational business unit and that of the entire organization (Boynton & Zmud, 1987).

Second, agility has a substantial impact on organizational structure. IT management practices and organizations are contingent upon the role that IT serves within an organization and the manner by which IT resources are made available to users, in particularly any internal IT environment (Boynton & Zmud, 1987). Additionally, the adoption of new technologies such as mobile, cloud, and other rapidly deployable technologies have a dramatic impact on how IT organizations are structured, operate, and function. At the same time, the introduction of these technologies in general, sets the often unreasonable expectations that the organization can continuously react quickly and effectively to changing markets driven by customized products and services while simultaneously eliminating non-value added activities to keep up with competitors (Lin, Chiu, & Tseng, 2006; Stangarone, 2014). The challenge is tremendously complex, in that organizations desiring to embrace agility in one part of the organization must adopt agility within all areas of their organization in order to completely address the demands of uncertainty and rapid change (Muduli, 2013).

Systems theory enables the exploration of various organizational components and the interconnections and boundaries that exists between them. As higher education organizations attempt to re-conceptualize operating structures in response to declining enrollment numbers and new budget appropriations in order to survive, systems theory framework not only permits the understanding of existing component interconnectedness, but also facilitates understanding how

the components would interact in the future. Systems theory can also help researchers better understand how automation and integration of technologies within business units and operations impacts the organizations, such as increasing the demand for hybrid business IT staff (Kastrul, 2008). Additionally, systems theory enables the exploration of the interconnectedness of traditional higher education organizations and structures with "new" structures and enabling technologies, such as the online only or hybrid type campus offerings (e.g., the University of Wisconsin System eCampus or University of Arkansas eVersity), which have little prerequisite to sustain, transition, or maintain prevailing coursework, curriculum, labs, classrooms, or general public technology environments.

Third, higher education organizations must be responsive to environmental changes, and organizational agility further enhances the amount of innovation that an organization can support and sustain. Outsourcing of both non-value added technologies and staff allows organizations to reduce costs while at the same time drastically reduce the turn-around time of new technologies and results (Kastrul, 2008). In higher education institutions, this requires a focused effort on understanding and responding to environmental changes, strong transparent leadership, employee empowerment, adaptive organizational design, overall focus on innovation, and appropriate budget models, at the same time collaborating to leverage technology investments that reflect the scale and capabilities of the organization. The new competition entering the higher education space has very little to no capital outlay for the maintenance and upkeep of conventional campus infrastructures, such as campus buildings and associated traditional IT infrastructure such as computer labs or campus Wi-Fi. The "younger" or "newer" organizations have the ability to fund cutting edge technologies that enable them to be more agile from day one. This creates significant challenges for existing higher education institutions that may be

forced to not only address a declining budget that is used to maintain existing legacy systems, but at the same time attempt to fund new innovations that would enable the ability to offer services that are market leading such as online only instruction or exclusively competency based curriculum.

In order to be prosperous, higher education organizations must be responsive to market changes, and there is no doubt that IT will be a key component in enabling the various organizational adaptations with technological innovations. Systems theory provides a conceptual framework for identifying and linking the various components that are responsible for sensing and responding to various environmental triggers. Similar to agility, where organizations aim to be responsive and agile, systems framework theorizes that feedback or reactions occur between multiple components of the system (Luhmann, 2013) and this feedback ultimately informs decision making and enables organizational responsiveness.

In summary, systems theory provides a foundational framework for exploring organizational agility from the various applicable perspectives, component relationships, their interconnectedness, and responsiveness. The next section discusses the concepts, history, and foundational components of systems theory.

**Systems Theory**

According to McCann (2004), "the adoption of broad systems theory concepts in management studies has been one of the most significant events in organizational effectiveness studies over the past 50 years and continues to shape thinking and practice" (p. 43). Fundamentally, systems theory enables the understanding of four primary concepts (Sweeny & Sterman, 2000). First, the understanding of behavior of a system arises from the interaction of agents. Second, systems theory enables the discovery and representation of feedback processes.

Third, systems theory allows for the identification of various components and the relationships that exist between them. Fourth, systems theory facilitates the recognition of boundaries and their related challenges.

Systems theory within an organizational context allows researchers to further explore the independencies among system units that operate at various levels within the organization (Stokols, Hall, Taylor, & Moser, 2008). Systems theory enables the study of organizational links and their representative components within their larger organizational context where it may be unnecessary or impractical to eliminate silos (Leischow & Milstein, 2006). Systems theory hypothesizes that the organization's various departments and groups exist as a dynamic interrelated whole, wherein changes in one part of the complex system triggers changes in other parts via a process of constant and active adaption (McCann, 2004). Systems theory, sometimes referred to as systems thinking, provides a theoretical framework for understanding how organizations adapt to various conditions and helps to explain the impact these adaptations may have on the larger organizational context. Researchers Moon and Kim (2005) claim systems theory conceptually enables the understanding of relationships that exist between input, black box, and output. From an organizational perspective, systems theory hypothesizes that organizations that have achieved the closest fit, or alignment, between the larger environment, their strategy, and their organizational design will be the most effective.

Researchers Leischow et al. (2008), in their theoretical rubric exploring team science in public health systems, identified four foundational components of systems thinking approaches shared across all fields and areas of study. First, systems thinking focuses on how new knowledge is gained, managed, exchanged, interpreted, integrated, and disseminated. Systems theory enables the exploration of organizational relationships, communication, connectivity,

collaboration, and knowledge flow within and between various organizational structures (Leischow et al., 2012). In other words, systems thinking is about exploring and understanding the complex systems, relationships, and models between people, collections of information, and concepts. From this perspective, systems thinking is concerned with the management and transfer of shared knowledge in the form of interactions between stakeholders and various system level components.

The second foundational component of systems thinking is the emphasis that is placed on network-centric approaches that encourage relationship building in order to achieve relevant goals and objectives (Leischow et al., 2008). This network centric component to systems thinking functions as the backbone to linking diverse stakeholders, individuals, and groups. Simply put, relationships work or do not work as a function of information sharing and whether it is communicated effectively. Without effective information and knowledge exchange occurring throughout the network, social networks and thus systems do not function effectively. The third foundational component of systems thinking is the capability to constructively examine and model behaviors and actions including intended and unintended consequences (Leischow et al., 2008). The goal of systems thinking is to enable better understanding of the system dynamics and more closely examine the complex adaptive components within the system.

The fourth component of systems thinking is the reconceptualization of traditional top-down management theory to one that is more network centric and participatory (Leischow et al., 2008). In this new theoretical organizational structure, the workforce is adaptive and learning oriented, organizing around partnerships and collaborations that enable improvements in organization structure and function. Although systems thinking attempts to overshadow

traditional top-down management principles such as comprehensive, centralized, hierarchical control, it does recognize the need for facilitative leadership roles (Boynton & Zmud, 1987).

In summary, systems thinking provides a generalized theoretical framework for exploring and modeling dynamic and adaptive networks of interrelated components, including knowledge transfer and the various associated relationships within and between various organizational structures and levels, conceptually similar to that of the federal government (Boynton & Zmud, 1987). However, not all environments have a fundamental shared strategy, strong organizational alignment, rationalized procedures, and common authority. More directly, these strong organizational structures are typically rare, in particular within educational institutions (Weick, 1976). Within higher education organizations, rationalized practices and completely agreed upon strategies and organizational goals are difficult to pinpoint and the various integrated components of systems thinking are often difficult to locate. Similarly, Weick (1976) argues that not all organizations are structured and managed according to rationalized assumptions, but even so, they may operate sufficiently similarly, endure throughout time, and can be recognized, labeled, and explored. From this perspective, these sorts of organizations are best explored from the loosely coupled systems perspective.

**Loosely Coupled Systems**

Loosely coupled systems theory is best explained by classifying a set of interconnected components that are responsive at the general or organizational level, albeit potentially weakly and intermittently, but operate largely independently at the component level (Weick, 1976). This independence, created by either physical or logical separation, enables various components to exhibit individual identities. Orton and Weick (1990) expand on the definition by stating that loose coupling refers to a set of interdependent elements that vary in number and strength at any

location in the organization. From a conceptual level, Weick (1976) identifies two commonly discussed coupling mechanisms: the technical core of an organization and the authority of the office. Technical coupling components refer to the technology, task, subtask, role, territory and person elements of an organization. On the other hand, the authority coupling components refer to positions, offices, responsibilities, opportunities, rewards, and sanctions that exist within an organization. The strength and amount of coupling between these various technical and authority components are essentially what holds the organization together, the strength of the coupling represented by a spectrum that varies from loose coupling to tight coupling.

Theoretically speaking, loosely coupled or tightly coupled systems are not inherently negative, but represent a spectrum of responsiveness and distinctiveness (Orton & Weick, 1990). Probert (2014) went so far as to argue that loose coupling can be seen as beneficial because loose coupling enables conflict to remain isolated, whereas tight coupling permits conflict to spread broadly (Luhmann, 2013). In addition, it is important to note that both responsiveness and distinctiveness are critical system components, and the lack of both within one organizational structure is extremely rare, because both components are fundamental concepts of systems.

Within the spectrum, tightly coupled systems are those that contain precisely prescribed steps and invariant sequences (Marcus, 1988). This side of the spectrum reflect systems that are highly responsive but exclude distinctiveness (Orton & Weick, 1990). Loosely coupled systems, on the other hand, are those systems that have distinctiveness without responsiveness. Loosely coupled systems are typically causally identified in one of three ways (Orton & Weick, 1990). One way loosely coupled systems are identified is from causal indeterminacy, or the inability to coordinate actions with results. Second, loose coupling can be recognized by fragmented external environments such as geographic dispersion, specialized market niches, and various

conflicting demands on the systems. Third, loose coupling can be acknowledged by a fragmented internal environment. As an example, Boynton and Zmud (1987) argued that the introduction of personal computers within an organization further fractured the internal technology environment by dispersing information and decision making capabilities widely throughout an organization.

In general, seven functions are generally associated with loosely coupled systems (Weick, 1976). First, opportunities exist for components of the system to persist, meaning the separateness of components enables some items to be preserved beyond the life of other components. Second, the disconnectedness of items and the independence between them permits greater sensing capabilities than more singular components. Third, loosely coupled systems permit location adaptation or agility that would otherwise be difficult to achieve in standardized structures. Fourth, loosely coupled systems permit more uniqueness, or innovation and diversity, than tightly coupled systems. Fifth, breakdowns occur in localized environments or within limited parts of the system and have little effect on other components. Sixth, loosely coupled systems enable a greater sense of determination and self-efficacy than in tightly coupled systems where discretion is limited. Seventh, loosely coupled systems lack the expense of tight coordination and integration, requiring fewer amounts of resources to enable and support the necessary coupling points.

Despite these identified functions of loosely coupled systems, Weick (1976) firmly states that simply the perception of unpredictability is not evidence of a loosely coupled system. He argues that often it is easier to see tightly coupled components and the associated interactions than to witness components that are less visible and less varying. Furthermore, he argues that people tend to over rationalize the meaning, predictability, and amount of coupling among the

various components in a system, often leading them to incorrectly identify tighter coupling among components than what actually exists.

With these caveats in mind, loosely coupled systems have been identified as an appropriate theoretical framework to explore and explain IT operations within various organizations. Boynton and Zmud (1987), in their review of IT planning, characterized IT environments that are highly decentralized, operate as a free market information economy, and have significant IT capability and resources within various business units as loosely coupled systems. Within these environments, Boynton and Zmud (1987) maintain that business unit managers have the desire, ability, and capability to acquire needed IT resources without any regard for a centralized IT function. This perspective supports Weick's (1976) depiction that loosely coupled systems have components that lack commonality and the components that the system have in common exist with little coordination. Within a loosely coupled IT organization, central IT functions simultaneously provide centralized direction and coordination while recognizing and respecting the increased amount of power and discretion business unit managers exert (Boynton & Zmud, 1987). In other words, central IT organizations must maintain responsibility over a pre-negotiated set of core components while relinquishing control of certain activities and responsibilities to others. Boynton and Zmud (1987) theorize that in these types of highly distributed IT organizations, central IT functions very much like the federal government, providing core infrastructure and mechanisms to facilitate the numerous and intertwined relationships that exist between various entities, with the important purpose to balance centralization and the efficiencies it enables, with the distributed decision making and the effectiveness it provides.

In a Sloan Management Review article nearly a decade later, authors Rockart, Earl, and Ross (1996) further supported this argument, IT needs to mimic the federal distribution of power, whereby autonomy is permitted at the local level, but organizational scale is realized. More recently, organizational scholars and IT leaders refer to this IT optimization with business line management and organizational strategy as IT governance. Peppard (2016) contends that the organizational adoption of IT governance strategies successfully fulfills the need of business line strategies with larger organizational outcomes such as cost containment, scalability, and information access.

Simply put, neither an IT monopoly nor complete business unit control of IT resources and direction is the appropriate course for organizational success (Boynton & Zmud, 1987), but a balanced approach to managing IT resources is needed. Core IT organizations must shift their focus from exclusively maintaining and supporting core applications to enabling the innovation and adoption of new technologies, positioning IT as a profit center in totality, focused on driving the businesses forward (Stangarone, 2014). IT organizations must support an increasingly complex business model yet respond to organizational changes with great agility while reducing costs (Kastrul, 2008), and this is particularly important for higher education IT organizations. The theory of loosely coupled systems provides a fundamental framework for the exploration of agility within an organizational environment that by the very nature of technology, introduces causal indeterminacy within a highly fractured internal and external environment.

The loosely coupled systems framework provides a useful starting point to more completely understanding organizational agility and the two interrelated and important concepts. First, the theory enables the exploration of organizational centralization and the interconnectedness it has with the amount of agility within the organizational environment, the

speed of technology adoption, and the adoption of defined governance processes and technology standards. Second, the theory facilitates the understanding of the relationships that exist between leadership focus on innovation and organizational centralization, and the three other key elements, the amount of organizational agility, the speed of technology adoption and the adoption of defined governance processes and technology standards. Understanding both the interconnectedness and relationships that organizational agility has with various organizational and business components is key to more completely understanding the complexity associated with agility. The next section of the dissertation begins to further explore the concept of agility and specifically the application of agility principles within an organization.

**Agility**

At the highest level, "agility is an enterprise-wide strategy for responding to a competitive and changing business environment" (Muduli, 2013, p. 56). Agility itself includes two fundamental processes, the ability to sense and the ability to respond (Javanmardi, Khabushani, & Abdi, 2012; Overby, Bharadwaj, & Sambamurthy, 2006; Sambamurthy, Bharadwaj, & Grover, 2003). Although agility within a manufacturing and supply chain environment is more broadly understood and explored from both theoretical and practical perspectives (Ngai, Chau, & Chan, 2011), the application of agility within an IT organization is a relatively new concept that has largely been unexplored. In IT environments, the exploration of agility relies heavily on the extension and application of existing organizational and workforce agility concepts as fundamental principles, while incorporating popular press and modern technologies at the specific technology component level. Consequently, within IT organizations, agility is most commonly referenced at one of three levels: organizational, workforce, or technology component.

**Organizational agility.** Organizational agility, the first and broadest level of agility, is defined as the successful exploitation of competitive bases that include speed, flexibility, innovation, pro-activeness, quality, and profitability through the integration of reconfigurable resources and best practices in a knowledge-rich environment to provide customer-driven products and services in a fast-changing market (Yusuf, Sarhadi, & Gunasekaran, 1999). Muduli (2013) further expands on this definition by adding that agility recognizes change, identifies the impact on competitiveness, sets out a strategy for becoming proficient at change by adopting the right structures and processes, embraces the right mindset, and deploys the right sort of ideological commitment to move forward despite the risks.

**Workforce agility.** At a more operational level is workforce agility. Workforce agility is what enterprises and organizations rely on to rapidly adjust organizational staffing to efficiently respond to unexpected and sudden changes in the environment. Workforce agility is defined as the "organized and dynamic talent that can quickly deliver the right skills and knowledge at the right time, as dictated by business needs" (Muduli, 2013, p. 57). Agile workforces are well trained and flexible and can adapt quickly and easily to new opportunities and market circumstances, strategically, and with high levels of uncertainty (Glinska, Carr, & Halliday, 2012; Muduli, 2013).

**Technology component.** The most granular level of agility within IT organizations is the particular technology components that are commonly associated with IT agility. The various concepts and terms of technological agility have gained significant attention in anecdotal and popular press in recent years. Kontzer (2011) formally defines agility within technological environments as how organizations handle emerging IT delivery models, while mitigating costs and introducing new technologies. Several modern-day technologies seemingly define IT agility

such as virtualization, cloud, mobile, or social to delivery models including Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS), and shared services model (Subhankar, 2012).

For the purposes of the dissertation, agility is explored within a systems framework to identify the roles and relationships that sensing and responding have in the observation and potential restructuring of sub-optimal forms that exist within organizational systems and structures (Rigby et al., 2000). The following sections provide a brief history of agility and identify the various components within organizational agility and their application to IT leaders.

**History of agility.** The term agility was introduced in the 1950s referring to an aircraft's ability to quickly maneuver (Richards, 1996). In the early 1990s, agility was applied to manufacturing in response to a congressional request to regain competitiveness in U.S. manufacturing (Javanmardi et al., 2012). Within the manufacturing context, agility refers to a system with capabilities to meet the rapidly changing needs of the marketplace (Yusuf et al., 1999). During this time, one of the first measurements of agility was created by Dove (1994) that identified cost, time, quality, and scope as components of agility in manufacturing. These specific components were later used in the implementation and management of IT projects to define and articulate the triple constraint concept, where scope, time, and costs directly influence quality of the deliverable (Brewer & Dittman, 2010). At a similar time, the term agility was applied to the broader business context (Muduli, 2013). Here, the goal of agility is to enrich and satisfy the organizational demand from customers and employees alike (Tseng & Lin, 2011).

Agility within IT organizations was first marginally explored in 2003 in an attempt to better understand how a business's IT investments and capabilities influence a firm's performance and adoption of processes that enable strategic advantages (Sambamurthy et al.,

2003). In 2006, the concept of agility was used to better understand the enabling role that technology can provide organizations (Overby et al., 2006). Both of these explorations occurred at a time well before the invention of modern cloud computing and even before the introduction of the iPhone and associated mobile device application stores. The first conceptual study on IT agility at the component level was conducted in 2010, which resulted in the identification of three primary high-level technologies that enabled IT flexibility: connectivity, compatibility, and modularity (Ngai et al., 2011). Even with the introduction and massive growth of mobile computing in 2007 and more recently, the introduction of cloud computing and SaaS applications, these original three capabilities continue to provide a firm foundation for IT agility.

Despite the advancement of agility from the manufacturing floor, to supply chain management, to the business environment, and ultimately to the IT organization, very few researchers have expanded on the measurement of agility or workforce agility (Gunasekaran, 1999; Muduli, 2013; Vinodh, Devadasan, Reddy, & Ravichand, 2010). With the lack of empirical research, it is not surprising that agility is often misunderstood or avoided within IT organizations. Supporting this, Sharifi and Zhang (1999) reported in their study of 1000 companies that just over fifty percent of leadership were aware of various agility principles, components, and capabilities.

**Components of agility.** In addition to the marginal exploration of agility, researchers have not agreed on what components constitute agility given the various applications and levels. Muduli (2013) argues the components of an agile workforce are: adaptive, flexible, developmental, innovative, collaborative, competent, fast, and informative. In their work evaluating agility in corporate enterprises, Ganguly, Nilchiani, and Farr (2009) argue that agility contains six components: speed/time, cost, responsiveness, flexibility, quality, and customer

needs. However, Breu, Hemingway, Strathern, and Bridger (2002) argue that agility is: environmental scanning, responsiveness to change, skill assessment and development, employee empowerment and autonomy in decision making, information and knowledge areas, collaboration and virtual organization, business process integration, Information Systems (IS) integration and workflow, Information and Communication Technology (ICT), and mobile technology.

At the most basic level, two key components must exist in an agile organization. First, organizations need to sense or perceive what changes are needed and to understand how change should occur. Second, agile organizations need to take action on these observations in order to accommodate needed transformation. Furthermore, researchers and practitioners have argued that these two components need to exist in harmony with various other organizational structures and processes in order to support future organizational success and efficiency (Boynton & Zmud, 1987; Marcus, 1988; Wade & Buechel, 2013). The lack of agility creates a complacent, but potentially highly structured and repeatable, environment whereas too much agility creates a highly responsive environment, but one that is lacking controls and scalability. In other words, organizational agility is highly interconnected with various other organizational components, structures, and processes (Murray & Greenes, 2006).

For the purposes of this dissertation, agility is explored at the organizational level. At this level, agility is most comprehensively defined as the ability of an organization to perform six fundamental processes: perceive or sense changes in the environment, process the impact by transitioning the data into knowledge, respond either pro-actively or reactively to the changing conditions, align structures or processes to incorporate changes, learn from the experience and incorporate the knowledge into future opportunities, and show competence that the processes

work and that information is being shared and acted upon at the appropriate time and appropriate levels within the organization (Seo & La Paz, 2008).

In summary, agility provides organizations tremendous opportunities to quickly assess and react to various market conditions and changing business environments, ensuring the persistent capabilities that enable and support organizational competiveness. However, agility alone will not create sustainable or highly scalable competitive offerings, commonly associated with mature "commodity" type offerings or organizational structures such as shared services. Therefore, organizations must seek opportunities to leverage and scale both organizational and business commonalities in order to grow, scale, and survive. One major component of this scalability is centralization of common organizational processes and functions, which is discussed in the next section.

**Centralization**

The second theoretical concept explored in this dissertation is centralization. Centralization, at the most tangible level, refers to an employee's independence in job decision-making and selection (Ahmadi, Fathizadeh, Sadeghi, daryabeigi, & Taherkhani, 2012). Within the organizational context, centralization and decentralization refer to the flexibility and independence in a unit's ability to independently make decisions that directly affect their business by means of how much control and flexibility they have with the various staff members and teams and associated reporting structures (Worley & Lawler, 2010). Bititci, Turner, and Ball (1999) resolutely state that those managing the business units understand best the competitive position and necessary strategies for success. In IT-specific organizations, IT centralization and decentralization refers to a continuum of employee alignment within a central IT organization (Tiwana & Konsynski, 2010). On the highly-centralized side of the spectrum, all IT employees,

despite areas of focus, report within a single IT organization, typically led by an individual referred to as the Chief Information Officer (CIO). On the other side of the spectrum, highly decentralized refers to an organizational structure with a small number of employees reporting to a single IT leader, and a large number of employees reporting to various distributed business units and associated leadership.

In highly centralized IT environments, all IT employees report within one single organization. These employees typically have a strong focus on a particular technical subject matter area, managed by leadership that typically has advanced technical competencies and knowledge of the respective area. In less mature organizations, IT staff are entirely focused on maintaining operations and have little involvement and engagement with the specific business units. In more mature organizations, IT may leverage staff and organizational structures to become more aligned with the business units so that trust is built and critical work is prioritized.

On the decentralized side of the spectrum, IT employees would be described as reporting to the various business lines or departments, aligned with a specific business unit functions, performing IT tasks under the direction of their respective business unit leaders. This concept of direct alignment within the organizational business unit would enable the business unit to be highly agile and innovative in their IT services and technology deliveries. In the highly-decentralized model, sometimes referred to as a distributed model in higher education institutions, IT employees report to leadership within their specific school, department, or business unit, and employees focus more broadly on various technical areas, but possess a strong understanding of the specific business unit needs. In these decentralized models, employees are typically led by business unit leaders who have an increasing level of knowledge with the business operations and processes side than technical or IT specific knowledge. It is noteworthy

that even in highly decentralized models, an organizational IT unit typically continues to exist as a central IT group, but normally performs very specific institutional-wide functions, such as networking, telephones, and data center management.

From an organizational perspective, centralization has been negatively associated with agility (Ahmadi et al., 2012). The general premise is that strategically differentiating processes should exist in an environment without rigorous, one-size-fits-all processes, and that these competitive differentiators should be aligned with local units that derive the direct respective benefits (Wade & Buechel, 2013). Within an IT organization, decentralization enables agility by allowing local IT departments to recognize important business unit trends, opportunities, and problems that may be overlooked, go unnoticed, or lack prioritization by a centralized IT department (Sambamurthy & Zmud, 2000). Decentralization enables local IT staff to quickly reprioritize and realign their work in order to address the specific needs that may otherwise go unaddressed (Tiwana & Konsynski, 2010). The general theory is that if information is widely distributed and known only by select business units, those units and associated staff members must be empowered in order to facilitate agility (Alavi, Wahab, Muhamad, & Shirani, 2014; Scott, 2006). Ahmadi et al. (2012) supports this argument by reporting that decentralized decision-making was one component to completing the enhancement of workforce agility. Additionally, Alavi et al. (2014) identified a significant positive correlation between decentralization of decision-making and workforce agility.

H1: IT organizational centralization within higher education institutions is negatively related to the amount of organizational agility that exists.

Although previous research has indicated that linear relationships exist between organizational centralization and agility, an alternate view postulates the relationship is

curvilinear rather than linear. Boynton and Zmud (1987), Marcus (1988), and Wade and Buechel (2013) argue that organizational structure and processes need to exist in harmony, suggesting that neither complete business control nor total IT organizational centralization is the appropriate structure in promoting agility.

RQ1: Does IT organizational centralization within higher education institutions have a curvilinear relationship with the amount of organizational agility that exists within the organization?

Similar to the impact decentralization has on empowering organizational agility, Tiwana and Konskynski (2010) found that organizational centralization was negatively related to the adoption of new technologies. They found that new technologies or requests for application changes simply never reached central IT's priority list in highly centralized IT organizations.

H2: IT organizational centralization within higher education institutions is negatively related to the speed of technology adoption.

Similar to the above belief that neither complete business unit control or total IT organizational centralization is suitable for organizational success, it is proposed that the relationship between organizational centralization and speed of technology adoption could be curvilinear rather than linear. One would suspect that speed of technology adoption would occur most optimally when a balance of organizational centralization exists rather than in highly centralized or decentralized organizations.

RQ2: Does IT organizational centralization within higher education institutions have a curvilinear relationship with the speed of technology adoption within an organization?

Organizational success not only requires the ability to sense and respond to changing market conditions and the willingness to leverage organizational scale and efficiencies associated with common or shared offerings, but success also requires that organizations seek out, evaluate, and implement novel ideas. The next section reviews the concept of innovation and the relationships it has with the above-mentioned components of organizational success.

**Leadership Focus on Innovation**

The third theoretical concept explored in this dissertation is leadership focus on innovation. The concept of leadership focus on innovation is the process by which organizations and leadership enable employees of an organization to be open to, receptive to, and capable of exploring new ideas (Hurley & Hult, 1998). Swanson and Ramiller (2004) define IT innovation as collecting and interpreting information from the environment, comprehending the data to make informed decisions, pursuing and deploying hardware or software, and finally, integrating the new routines with legacy systems and processes.

Employees who are empowered to innovate, who explore new ideas, examine and learn new technologies, and have opportunities to put new technologies into practice, have the greatest impact on organizational agility. Innovative employees contribute to improving not only the overall agility of an organization, but the overall performance level of the firm as well (Kamhawi, 2012). Lin (2011) found that the adoption of cutting edge technologies, such as electronic human resource management tools, positively affects organizational agility and the ability to build and maintain innovative competitive advantages. Similarly, a 2005 study that used the Technology Acceptance Model (TAM) framework to explore Malaysian manufacturing firms discovered that fundamental technology innovation, adoption, and acceptance had the strongest effects on organizational agility (Zain, Rose, Abdullah, & Masrom, 2005).

Although leadership focus on innovation can be a rather ambiguous concept representing the organizational perspective of vision and culture, another potential measure represents the financial perspective of the organization. In this financial model, innovation is represented by the percent of budget allocated to exploring, researching, and testing new IT systems and processes versus what is allocated to simply operate or grow the business. "Run, grow, transform" is a budgeting framework that refers to the concept of managing an IT budget in three specific expense categories (Vaes, 2013). The budget category of run refers to the general day-to-day expenses that keep the IT infrastructure running, sometimes referred to as "Stay in Business" budget. The run category of the budget refers strictly to the amount of budget allocated to keep things afloat or sometimes called the budget floor. Organizations that have a large portion of their budget allocated to run category are simply surviving with little to no innovation taking place. The run budget category is typically the last budget category affected by any significant budget cuts, but in the recent turbulent times in higher education, the year over year budget cuts may have even significantly reduced these base budgets as well.

Grow refers to the category of budget set aside to extend existing IT services to new areas or expand their capabilities. Grow budgets are typically tied to an organization's strategic initiatives such as expanding wireless coverage or making small incremental changes to existing systems (Vaes, 2013). These budget categories provide opportunities for some restructuring and potential opportunities for deferral in times of significant budget constraints, but are typically not seen as funding set aside with the specific purpose of innovation.

Transform, or transformative budgets, on the other hand, are suggestive of the budget category that reflects the exploration and adoption of innovative new technologies that radically and fundamentally change and enhance the capabilities IT can provide. The transform budget

category refers to the amount of budget allocation set aside for innovative and new projects. This category of budget typically contains the most amount of discretion and the least amount of financial accountability.

H3: Leadership focus on innovation within a higher education institution is positively related to the speed of technology adoption.

Additionally, Lin and Lin (2010) argue that appropriate management and organizational structures are key for promoting individual creativity and encouraging innovation. From an organizational standpoint, current theoretical perspectives suggest that decentralized decision making is a critical component for supporting innovation (Ash & Goslin, 1997).

H4: Leadership focus on innovation within a higher education institution is negatively related to IT organizational centralization within a higher education institution.

Additionally, one could suspect that the speed of technology adoption within an organization and IT organizational centralization could have a curvilinear relationship with leadership focus on innovation. Within higher education organizations, leaders are required to balance significantly fewer organizational innovation capabilities than traditional corporate organizations. This limited spectrum of opportunities would imply that even highly innovative higher education organizations must strictly balance extremely limited finances and organizational resources with the demands of operating the institution with the desires of proactively seeking innovations.

RQ3: Does leadership focus on innovation within a higher education institution have a curvilinear relationship with the speed of technology adoption?

RQ4: Does leadership focus on innovation within a higher education institution have a curvilinear relationship with IT organizational centralization?

As a baseline, the 2012/13 Educause core data set of higher education institutions reflects that on average, 79% of campus IT budgets are spent within the run category, 13% within the grow category, and 6% within the transform category (Katsouros, Piret, Sparrow, Theron, & Weil, 2014). Comparing this to the 2013 Gartner IT Key Metrics Data for all industries, the average spent in the run category was 65% of their budgets, 20% in the grow category, and 15% in the transform category (Gartner, 2012).

Agility is about innovating and the ability to learn and respond quickly (Dove, 1994) with the appropriate amount of available resources, financial resources being one key identifier. Organizations with their entire budget allocated in the run and grow budget categories, have very little resources, if any, available to dedicate towards the transform category, which is positively related with innovation and organizational agility. On the opposing side of the spectrum, organizations that have flexibility in their budgets, reflected in the amount of available funding in the transform category of budget, have significantly more latitude in empowering employees to innovate, ultimately fostering organizational agility. Higher education institutions are unlike traditional businesses that may derive up to 70% of their revenue from their research and development opportunities, or the transform category of their budget (Porodzinsky, 2014). However, one thing is clear: strategic IT investment enables a firm to be more agile (Lu & Ramamurthy, 2011).

H5: Leadership focus on innovation within a higher education institution is positively related to the amount of agility that exists across the organization.

Similar to the above hypotheses and research questions, it is possible that the relationship between leadership focus on innovation and the amount of agility that exists within the organization is curvilinear rather than linear. The overall perspective is that although higher

education organizations can be agile, they typically have significant amounts of resources tied to sustaining existing systems and processes, introducing artificial ceilings to even the most innovative of organizations.

RQ5: Does leadership focus on innovation within a higher education institution have a curvilinear relationship with the amount of organizational agility that exists within the organization?

In addition, systems theory perspective hypothesizes that highly centralized organizations have fundamental standards in place. These important and adopted standards support and create the core infrastructure for the effective organization operation, while enabling local information processing (Boynton & Zmud, 1987).

H6: IT organizational centralization within higher education institutions is positively related with the adoption of defined governance processes and technology standards.

Similar to the above research questions regarding curvilinear relationships with organizational centralization, it is proposed that the relationship between organizational centralization and the adoption of infrastructure standards and services is curvilinear. One could suspect that IT organizational centralization must exist in harmony with the larger and likely more complex university organizational structure and this balance of structure and power would impact the adoption of infrastructure standards and services.

RQ6: Does IT organizational centralization within higher education institutions have a curvilinear relationship with the adoption of defined governance processes and technology standards?

Kastrul (2008) argues that organizations desiring to support a complex and changing landscape of business need to recognize the benefits of creating scalable and routine processes and standards to more efficiently enable innovation while controlling costs. This operating approach would indicate that organizations that are increasingly focused on being innovative would be more inclined to leverage scalable core business infrastructure.

H7: Leadership focus on innovation within a higher education institution is positively related with the adoption of defined governance processes and technology standards.

Lastly, one could speculate that the relationship between an organization's leadership focus on innovation and the adoption of identified governance process and standards would be curvilinear rather linear. The general concept is that organizational focus on innovation needs to exist in harmony with any defined standards in order to influence and support creativity within the organization.

RQ7: Does leadership focus on innovation within a higher education institution have a curvilinear relationship with defined governance processes and technology standards?

The next section discusses the method used to explore these various hypotheses and research questions.

## Method

### Overview

This study explores the relationships organizational agility has with two key empowerment related concepts: organizational centralization and leadership focus on innovation. For the purposes of exploring these concepts, the Educause 2015 Core Data Services (CDS)

survey data set is utilized (Educause, 2015) with permission granted by the Educause organization (See Appendix A). Educause is the premier non-profit association of higher education IT leaders and professionals committed to advancing higher education by helping those who lead, manage, and use information technology to shape their campus's strategic IT decision at every level (Educause, n.d.a). The Educause CDS survey data set is the appropriate instrument for this study because the study's existing sample population of higher education organizations directly reflects the desired study population.

**Participants**

The Educause CDS survey has been conducted annually since 2002 (Lang, 2016), and the 2015 data includes data from 822 participant institutions both within and outside the United States. Educause solicits participation in the survey initially through a single primary campus representative, traditionally the highest-ranking IT leader on campus, who maintains and pays for the campus Educause membership fee. The responsibility for completing the various sections of the annual survey is typically handed down to various individuals within that central organization such as assessment or budget officers, with the capability to further delegate various survey components to assorted subject matter experts. The 2015 data set gathered data by way of 172 primary questions throughout eight modules: (a) IT Organization, Staffing, and Financing, (b) Support Services, (c) Educational Technology Services, (d) Research Computing Services, (e) Data Centers, (f) Communication Infrastructure Services, (g) Information Security, and (h) Information Systems and Applications.

822 responses were included in the dataset. 193 responses represented doctoral institutions (23.5 percent), 223 represented master's level organizations (27.1 percent), 160

baccalaureate (19.5 percent), 149 associate (18.1 percent), and 97 specialty institutions (11.8 percent).

748 institutions reported data on the number of full-time equivalent students. Of these, the average number of student FTE reported was 8918 students ($M$ = 8918.70, $SD$ = 9865.71). 409 institutions reported campus financial data for IT, and the average campus total IT budget for these respondents was $18,847,386 ($M$ = 18,847,386.8, $SD$ = 42,117,901.3).

**Procedures**

The Educause CDS survey data set provides an ideal starting point for exploring the research topics of agility, centralization, and leadership focus on innovation within higher education institutions. Educause members represent over 1,800 colleges and universities focused on exploring and addressing higher education IT challenges (Educause, n.d.b). Historically, Kenneth Green's The Campus Computing Project Survey was touted as the largest continuing study (Green, n.d.), however, this is no longer the case. Although the study still appears to be conducted, the last publicly available data from the study was published in 2010, contained only 523 survey respondents, and focused solely on American higher education institutions.

Upon receiving permission from Educause to use the data set, a formal request for approval from the UW-Milwaukee campus Institutional Review Board (IRB) was sought with the objective to receive formal certification that the study was not engaged in human subjects research. Upon evaluation, the campus IRB made the determination that the research did not constitute human subjects research and a full IRB review was not necessary (See Appendix B).

**Measures**

**Control variables.** Three control variables are included in the study that could potentially influence the various other variables being explored. The first control variable is the

peer higher education group, represented by five different institution types in the Educause data: associate, baccalaureate, master, doctoral, and other or specialty institutions. Because peer higher education group is a nominal variable, the variable was dummy coded within SPSS. The baseline group was determined to be the master's peer group, which is reflective of the majority of Educause CDS participants (Field, 2005). The second control variable was the number of full-time equivalent students within the institution. The third control variable was the total campus IT budget comprised of both operating, capital, and other expenses within the entire institution, including both central and distributed IT units. This variable was calculated from the Educause survey response variable representing central IT's total budget and distributed IT's total budget.

**Agility.** An existing framework by Seo and La Paz (2008), which defined organizational agility as a set of six interrelated components or processes, provides the foundation for exploring and aligning agility components within the Educause CDS data. The six organizational agility components identified by Seo and La Paz are: perception, processing, responding, aligning, learning, and competencies. Perception, or sensing, is the ability to receive either strong or weak data from internal and external sources. Processing refers to the ability to create knowledge out of the data in order to make informed decisions. Responding refers to the ability to quickly and appropriately act on knowledge. Aligning is the ability to re-evaluate and re-align existing processes and resources to adopt the new business processes. Learning refers to the ability to build on experiences and reapply the knowledge to address future challenges. Lastly, competencies refer to the knowledge about the market and the processes between internal and external partners that support the agile processes. Because the Educause CDS survey does not expressly evaluate organizational agility, a five-step process was used to identify components

and structures of agility. First, the Seo and La Paz (2008) framework for organizational agility was outlined and defined as a foundational framework for defining six dimensions of organizational agility.

Second, the author closely examined the Educause CDS survey instrument to identify survey components that closely align with each of the various dimensions of organizational agility. Because the Seo and La Paz framework of organizational agility along with the measures within the Educause CDS survey have not been closely examined and validated for the purposes of exploring organizational agility within a higher education IT organization, the researcher initially assessed the specific Educause survey question (component) fit within the organizational agility framework based on face validity (See Appendix C). Face validity is a common approach which allows researchers to advance arguments that a particular measurement identifies with what it was intended to measure (Reinard, 2008).

Third, for the purposes of ensuring content validity, an expert panel of communication faculty and IT practitioners reviewed the initial assignment of Educause CDS survey questions within the organizational agility framework. Content validity is used to help ensure that the selection and alignment of the various Educause CDS survey questions are accurately assigned to the agility components they are intended to measure (Churchill, 1979). Ambiguities and disagreements related to survey questions assignments within particular framework dimensions were discussed and resolved. Fourth, transformations were conducted to convert the three-existing text-based scales into numerical values. Lastly, one question in the survey was asked in reverse direction and the Likert-type scale was reverse-coded for this variable to ensure that forthcoming tests for statistical reliability would not be affected (Field, 2005).

Fifth, an exploratory factor analysis with Varimax rotation was conducted to evaluate the hypothesized model fit. In general, factor analysis allows researchers to explore concepts that have many facets or groups of different variables representing higher level dimension (Field, 2005). Factor analysis allows researchers to identify the maximum amount of common variance using the smallest number of dimensions. In this specific case, exploratory factor analysis enabled researchers to explore loosely or ill-defined latent constructs and underlying structures among a set of variables in a data set (Jung, 2013) and thus attempt to reduce a large number of variables into a small number of items referred to as factors. Varimax rotation was used, as it attempts to broaden the number of factors identified by attempting to load a smaller number of variables onto each factor (Field, 2005). The 2015 Educause data set contains over 800 responses, which exceeds Comrey and Lee's (1992) and Tabachnick and Fidell's (2001) target sample size of 300 for exploratory factor analysis.

Although a confirmatory factor analysis may appear to be a better mechanism to validate model fit, in particular with existing measurement standards, the lack of previous research on organizational agility, and specifically the examination of potential untested factors within the existing Educause CDS data set, calls for statistical tests that are more investigatory (Lichtenstein et al., 2008). Exploratory factor analysis allows researchers to test new scales with factor loadings that can be much more flexible. Once the scale and measures are validated via an exploratory factor analysis, future research could leverage the confirmatory factor analysis.

With regard to this particular study, the emergent factor structure was evaluated for loading at a minimal level because of the investigative nature of exploratory factor analysis. A factor loading at a minimum of .298 is considered acceptable when more than 300 samples are being evaluated (Stevens, 1992). Additionally, the potential for high loadings of constructs and

lack of cross loading would further support construct validity. The resultant factor structure was compared against the hypothesized six-dimensional framework of organizational agility.

The emergent factor structure resulted in five components, with all factors loading greater than .39 (See Appendix D). No distinct factor for perception or processing emerged, but the items converged within one factor and were ultimately combined, representing perception and processing. In summary, seven survey items comprised the factor perception and processing, four for responding, four for aligning, five for learning, and nine for competencies. Table 1 outlines the factor loadings, eigenvalue, percentage of variance explained, and Cronbach's alpha.

Construct reliability, or item convergence, was measured via Cronbach's alpha, which is a widely-used measure of internal item convergence (Streiner, 2003). Cronbach's alpha enables researchers a method to determine whether deleting a particular variable in the construct would increase the overall reliability (Thao, 2012). A minimum Cronbach's alpha threshold of 0.6 is considered acceptable because of the exploratory nature of the construct (Straub, Boudreau, & Gefen, 2004). In all emergent factors, the Cronbach's alpha was higher than .82.

**IT centralization on campus.** The proportion of campus IT centralization was calculated in two ways via existing data collected in the Educause CDS survey. The first method identified the proportion of IT centralization based on the number of full time equivalent staff within each organization. Data computations occurred in SPSS and calculated the proportion of "Total FTE" in central IT and that of decentralized IT staff, referred to in the Educause CDS data set as "IT Staff FTE outside of central IT," by dividing the number of "Total FTE" in central IT by the sum of both "Total FTE" in central IT and "IT Staff FTE outside of central IT."

The second method to identify the proportion of IT centralization was to calculate budget expenditures. Similar to above calculations, data transformation occurred in SPSS and

calculated the proportion of "Total IT expenditures" in central IT and that of decentralized IT, referred to as "IT expenditures outside of central IT," by dividing the number of "Total IT expenditures" in central IT by the sum of both "Total IT expenditures" in central IT and "IT expenditures outside of central IT."

Following this, a correlation analysis was conducted between both proportions, FTE and expenditures, to evaluate if they are statistically related and can be combined, or if they are statistically distinct and require discrete evaluations. A statistically significant positive correlation was revealed, $r$ (389) = .784, $p < .001$, representing a large effect size (Cohen, 1992), and ultimately these two proportions were combined via their average.

**Speed of technology adoption.** The speed of campus technology adoption directly used the Educause CDS survey question which asked, "What was your institution's preferred overall approach to adopting technology?" Data transformations were conducted to convert the text based scales (last to adopt, after our peers, pace with our peers, where we saw exceptional benefits, and among the very first) into numerical values corresponding and aligning with speed of technology adoption.

**Defined governance processes and adoption of technology standards.** Defined governance processes and adoption of technology standards were measured directly using two Educause survey questions. The first question inquired if the campus IT governance process creates a campus-wide view of technology standards and services. This question was also answered with a Likert-type scale that was converted into numerical values. The second question (i.e., does central IT maintain any service portfolio catalogs, and if so, are they solely for central IT, or do they include distributed IT as well?) represents the investigation of adoption

of technology standards. This three-item Likert-type scale (no, yes distributed IT not included, yes, includes distributed IT) was converted into numerical values (0, 1, 2).

Similar to above variable examination, a correlation analysis was conducted between both variables to evaluate if they are statistically related and can be combined, or if they are statistically distinct and require discrete evaluations. A positive correlation was revealed, $r$ (797) = .137, $p < .001$, reflecting a small effect size according to Cohen (1992) and ultimately these two variables were not combined.

**Leadership focus on innovation.** Leadership focus on innovation was explored via two discrete measures. First, the study explored the concept of leadership focus on innovation from the institutional budgeting perspective. The budgeting concept of identifying financials within the run, grow, and transform category directly relates to two existing survey components on the Educause CDS survey. These two survey components focus on the percentage of organizational expenditures in these three categories across two higher level budget groupings, operational and capital budgets. The direct measurement in the Educause survey reflects the proportion of budget allocated to innovation in both the operating and capital expenditures of the campus.

Once again, a correlation analysis was conducted between both variables to evaluate if they are statistically related and can be combined, or if they are statistically distinct and require discrete evaluations. A positive correlation was revealed, $r$ (485) =.292, $p < .001$. According to Cohen (1992), this reflects a medium effect size and ultimately these two variables were not combined.

The second method by which leadership focus on innovation was explored was from an organizational vision and culture perspective. Similar to the above factor analysis, the author closely examined the Educause CDS survey instrument and identified 11 survey components via

face validity that closely represented the concept of leadership focus on innovation. Following this, an expert panel reviewed the components from a content validity perspective. The existing Likert-type responses for the various questions were converted into numerical values and an exploratory factor analysis with Varimax rotation was conducted to evaluate the hypothesized model that the variables survey questions represented a single component. Principal component analysis with Varimax rotation revealed a single-factor structure, with all factors loading .79 or higher, explaining 71.30% of the variance, and Cronbach's alpha was .96, which was acceptable for the type of analysis being performed (Field, 2005). Ultimately, these 11 survey components were combined into one variable, representing leadership focus on innovation from an organizational vision and culture perspective. Example questions include: "The organization has developed, communicated, and invested in clear support strategies. Explicit learning budgets exist and innovation time is built into schedules," and "A focus on innovation drives the vision of the organization which is explicitly linked to students' needs. Participants at all levels can articulate the vision." Table 2 shows the factor loading, eigenvalue, percentage of variance explained, and Cronbach's alpha.

**Data Analysis**

All predictor variables — leadership focus on innovation from an organization vision and culture perspective, transform capital budget, transform operating budget, and the newly converged IT centralization proportion — were mean-centered by subtracting the sample mean from each measurement to ensure that estimated effects are always within range of the data being explored (Hayes, Glynn, & Huge, 2012). In addition, the two non-dummy coded control variables, student FTE count and total campus IT budget, were also mean-centered. Lastly, the four variables that were being explored from a curvilinear perspective were squared: leadership

focus on innovation from an organization vision and culture perspective, transform capital budget, transform operating budget, and the newly converged IT centralization proportion.

Prior to conducting the data analysis, the data were examined for participant nonindependence. The goal was to better understand the potential influence various higher education state systems have with the associated institutional responses and to ensure that there was independence in the responses (Field, 2005). 15 higher education systems within the United States and their associated 124 member institutions were identified as study participants and were coded as classes within SPSS. These higher education systems have been identified in Table 3. A statistical test was run on each study variable to check for nonindependence. All study variables reflected variations among the means. Correlations were extremely low, .246 for the converged variable of IT centralization and less than .103 for the remainder of the study variables. The correlations have been identified in Table 4. Independence of the higher education system member institutions had been established.

Additionally, a correlation analysis of study variables was conducted. Three strong correlations were discovered. Leadership focus on innovation from a vision and organizational culture perspective had a strong positive correlation with the organizational agility factor of learning, $r$ (618) = .894, $p < .01$. The organizational agility factor of aligning had a strong positive correlation with defined governance processes, $r$ (797) = .763, $p < .01$. Lastly, student FTE had a strong positive correlation with total campus IT budget, $r$ (372) = .713, $p < .01$. The entire correlation table has been included in Table 5.

The analysis of data for all seven hypotheses was explored via quantitative methods using regression analysis conducted via SPSS. Regression analysis enables researchers to understand patterns of variability among variables and to make accurate predictions of the relationships

among them (Winer, Brown, & Michels, 1991). Further, regression analysis enables researchers to identify the predictive relationships that exist between the independent variables and their impact on the dependent variables.

For the purposes of testing the various hypotheses, regression analysis aims to enable a clearer understanding of the expected changes in the dependent variable because of observed or induced changes in the independent variable (Pedhazur, 1997). Regression analysis is an appropriate method for examining, at a high level, the relationships that exist between variables. Because several existing theoretical outcomes have been identified between the study variables, researchers are able to cautiously predict interactions between independent variables and the expected changes in dependent variables. For this particular study, regression analysis allows the theoretical exploration of variables that exist within a sample population of higher education IT organizations.

Four sets of regression analyses were conducted to test the study's hypotheses and research questions. The first set of five regression analyses predicted the five identified factors of agility from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation. This set of regression analyses explored H1, RQ1, H5, and RQ5.

The second set of one regression analysis predicted the speed of technology adoption from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation. This regression analysis investigated H2, RQ2, H3, and RQ3. The third set of one regression analysis investigated H4 and RQ4, and predicted organizational centralization from linear leadership focus on innovation and quadratic leadership focus on innovation.

The fourth set of two regression analyses tested H6, RQ6, H7, and RQ7, and predicted the adoption of defined governance processes and technology standards from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation. In summary, the study has four outcome variables: agility, speed of technology adoption, organizational centralization, and defined governance processes and adoption of technology standards.

## Results

A series of simultaneous multiple regression analyses were performed to understand the relationship between leadership focus on innovation, organizational centralization, and three critically important interrelated concepts: organizational agility, speed of technology adoption, and defined governance processes and technology standards.

### Prediction of Organizational Agility Factors

The first set of regression analyses explored H1, RQ1, H5, and RQ5 and consisted of running five distinct regression tests to explore the five emergent factors of organizational agility.

**Prediction of organizational agility factor of perception and processing.** The combination of variables to predict the organizational agility factor of perception and processing from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F$ (14, 114) = 1.983, $p$ = .025. The beta coefficients are presented in Table 6. The adjusted $R^2$ value was .097. This indicates that approximately 10% of the variance in the organizational agility factor of perception and processing was explained by the model. According to Cohen (1992), this is a small effect size. Note that one control variable, the

dummy variable representing doctoral institutions, significantly predict the organizational agility factor of perception and processing when all variables are included, $\beta = .295$, $p = .024$.

When specifically evaluating H1, the predicted negative relationship between organizational centralization and the agility component of perception and processing, the hypothesis was not supported, $\beta = .321$, $p = .103$. Additionally, no support was discovered for RQ1, which examined whether the relationship was curvilinear, $\beta = .062$, $p = .714$. In addition, when evaluating H5, leadership focus on innovation predicting the agility component of perception and processing, the hypothesis was partially accepted. One linear regression, leadership focus on innovation from organizational vision and culture perspective, was statistically significant, $\beta = .265$, $p = .036$. On the other hand, H5 was not supported from the two additional components representing the financial perspectives of leadership focus on innovation, specifically transformative operating budget, $\beta = -.059$, $p = .664$, and transformative capital budget, $\beta = .074$, $p = .665$. Finally, no support was discovered for RQ5, which examined whether the relationship between leadership focus on innovation and the organizational agility component of perception and processing was curvilinear.

**Prediction of organizational agility factor of responding.** The combination of variables to predict the organizational agility factor of responding from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F(14, 114) = 2.625$, $p = .002$. The beta coefficients are presented in Table 7. The adjusted $R^2$ value was .151. This indicates that approximately 15% of the variance in the organizational agility factor of responding was explained by the model. According to Cohen (1992), this is a small effect size.

When explicitly evaluating H1, the predicted negative relationship between organizational centralization and the agility component of responding, the hypothesis was not accepted, $\beta = .054$, $p = .775$. Additionally, no support was discovered for RQ1, which examined whether the relationship was curvilinear, $\beta = .029$, $p = .861$. In addition, when assessing H5, leadership focus on innovation predicting the agility component of responding, the hypothesis was partially accepted by one of the linear regressions, leadership focus on innovation from organizational vision and culture perspective, $\beta = .436$, $p < .001$. However, the other two components representing the financial perspective, transformative operating budget, $\beta = .165$, $p = .208$, and transformative capital budget, $\beta = .006$, $p = .969$, did not provide support for H5. Finally, curvilinear leadership focus on innovation from an organization vision and culture perspective provided moderate support for RQ5, $\beta = -.321$, $p = .007$ (see Figure 1). The agility factor of responding was highest at moderate levels of leadership focus on innovation from a culture and vision perspective. The other two financial components that examined RQ5 provided no support for a curvilinear relationship between leadership focus on innovation and the organizational agility component of responding.

**Prediction of organizational agility factor of aligning.** The combination of variables to predict the organizational agility factor of aligning from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F(14, 185) = 6.447$, $p < .001$. The beta coefficients are presented in Table 8. The adjusted $R^2$ value was .277. This indicates that approximately 28% of the variance in the organizational agility factor of aligning was explained by the model. According to Cohen (1992), this is a large effect size.

Specifically, when evaluating H1, organizational centralization predicting the agility component of aligning, the hypothesis was not accepted, $\beta = .228$, $p = .118$. Additionally, no support was discovered for RQ1, which examined whether the relationship was curvilinear, $\beta = .131$, $p = .336$. In addition, when evaluating H5, leadership focus on innovation predicting the agility component of aligning, the hypothesis was partially accepted by leadership focus on innovation from organizational vision and culture perspective, $\beta = .510$, $p < .001$, and from the curvilinear transformative operating budget, $\beta = -.203$, $p = .019$, where the agility factor of aligning was highest when transformative operating budget was moderate (see Figure 2). However, the other financial component of transformative capital budget provided no support for the hypothesis, $\beta = .120$, $p = .350$. Lastly, with regards to RQ5, which examined the curvilinear relationship between the organizational agility component of aligning and leadership focus on innovation, no additional support was provided other than the supporting variable mentioned above, the transformative operating budget.

**Prediction of organizational agility factor of learning.** The combination of variables to predict the organizational agility factor of learning from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F(14, 181) = 50.983$, $p < .001$. The beta coefficients are presented in Table 9. The adjusted $R^2$ value was .782. This indicates that approximately 78% of the variance in the organizational agility factor of learning was explained by the model. According to Cohen (1992), this is a large effect size. Note that two control variables, the dummy variable representing the "other" peer higher education group and baccalaureate institutions significant predict the organizational agility factor of learning when all

variables are included. Beta coefficients for these respective predictors were: $\beta = .080$, $p = .029$; $\beta = .095$, $p = .025$.

When directly evaluating H1, organizational centralization predicting the agility component of learning, the hypothesis was not accepted, $\beta = -.004$, $p = .963$. Additionally, no support was discovered for RQ1, which examined whether the relationship was curvilinear, $\beta = .015$, $p = .844$. In addition, when evaluating H5, leadership focus on innovation predicting the agility component of learning, the hypothesis was partially supported by leadership focus on innovation from organizational vision and culture perspective, $\beta = .847$, $p < .001$. However, the other two financial components of transformative capital budget and transformative operating budget provided no support for the hypothesis. Lastly, with regards to RQ5, which examined the curvilinear relationship between the organizational agility component of learning and leadership focus on innovation, no support was provided by any of the components.

**Prediction of organizational agility factor of competencies.** The combination of variables to predict the organizational agility factor of competencies from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F(14, 114) = 2.468$, $p = .004$. The beta coefficients are presented in Table 10. The adjusted $R^2$ value was .138. This indicates that approximately 14% of the variance in the organizational agility factor of competencies was explained by the model. According to Cohen (1992), this is a medium effect size.

When expressly evaluating H1, organizational centralization predicting the agility component of competencies, the hypothesis was not accepted, $\beta = .346$, $p = .072$. Additionally, no support was discovered for RQ1, which examined whether the relationship was curvilinear, $\beta$

= .202, $p$ = .227. In addition, when evaluating H5, leadership focus on innovation predicting the agility component of competencies, the hypothesis was partially accepted by leadership focus on innovation from organizational vision and culture perspective, $\beta$ = .382, $p$ = .002. However, the other two financial components, transformative capital budget and transformative operating budget provided no support for the hypothesis. Lastly, with regards to RQ5, which examined the curvilinear relationship between the organizational agility component of competencies and leadership focus on innovation, no support was provided by any of the components.

**Prediction of organizational agility factors summary.** In summary, the relationships between the five distinct factors of agility and the four predictive components of linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation were examined. Institutions reported higher scores on the agility factor of perception and processing when leadership focus on innovation was higher, and when the institution was a doctoral (as opposed to a master's) institution.

Institutions also reported higher scores on the agility factor of responding when leadership focus on innovation was higher. In addition, institutions reported that the agility factor of responding was highest when innovation focus is moderate (as opposed to high or low). Institutions also reported higher scores on the agility factor of aligning when leadership focus on innovation was higher, and when the transformative operating budget was moderate (as opposed to high or low). Institutions further reported higher scores on the agility factor of learning when leadership focus on innovation was higher, and when the institution peer group was either baccalaureate or other as opposed to a master's institution.

Lastly, institutions reported higher scores on the agility factor of competencies when leadership focus on innovation was higher. Overall, all five identified factors of agility were reported higher when leadership focus on innovation was high.

**Prediction of Speed of Technology Adoption**

To explore the second set of hypotheses and research questions: H2, RQ2, H3, and RQ3, a similar simultaneous multiple regression analysis was performed. The combination of variables to predict the speed of technology adoption from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F$ (14, 185) = 6.979, $p < .001$. The beta coefficients are presented in Table 11. The adjusted $R^2$ value was .296. This indicates that approximately 30% of the variance in the speed of technology adoption was explained by the model. According to Cohen (1992), this is a large effect size. Note that one control variable, the dummy variable representing doctoral institutions significant predict the speed of technology adoption when all variables are included. Beta coefficients for these respective predictors were: $\beta$ = -.294, $p$ =.002.

When directly evaluating H2, organizational centralization predicting the speed of technology adoption, the hypothesis was rejected, $\beta$ = -.157, $p$ =.277. Additionally, no support was discovered for RQ2, which examined whether the relationship was curvilinear, $\beta$ = -.004, $p$ = .976. In addition, when evaluating H3, leadership focus on innovation predicting the speed of technology adoption, the hypothesis was partially accepted by leadership focus on innovation from organizational vision and culture perspective, $\beta$ = .464, $p < .001$. However, the other two financial components, transformative capital budget and transformative operating budget, provided no support for the hypothesis. Lastly, with regards to RQ3, which examined whether a

curvilinear relationship exist between the leadership focus on innovation and speed of technology adoption, no support was provided by any of the components.

**Prediction of speed of technology adoption summary.** In summary, institutions reported higher speed of technology adoption when leadership focus on innovation was higher. In addition, when the institution was doctoral, they reported slower speeds of technology adoption, as opposed to a master's institution.

**Prediction of Organizational Centralization**

A similar simultaneous multiple regression analysis was performed to explore the third pair of hypothesis and research question: H4 and RQ4. The combination of variables to predict organizational centralization from linear leadership focus on innovation and quadratic leadership focus on innovation was statistically significant, $F$ (12, 188) = 40.725, $p < .001$. The beta coefficients are presented in Table 12. The adjusted $R^2$ value was .704. This indicates that approximately 70% of the variance in the IT organizational centralization was explained by the model. According to Cohen (1992), this is a large effect size. Note that two control variables, the dummy variable representing doctoral institutions and the total campus IT budget, significant predict IT organizational centralization when all variables are included. Beta coefficients for these respective predictors were: $\beta = -.356$, $p < .001$; $\beta = -.491$, $p < .001$.

Specifically, when evaluating H4, leadership focus on innovation having a negative relationship with centralization, the hypothesis was not supported. Unexpectedly, the transformative capital budget subcomponent of leadership focus on innovation was statistically significant in the positive direction, opposite of what was predicted, $\beta = .180$, $p = .026$. The other financial component, transformative operating budget and the leadership focus on innovation from the organizational vision and culture perspective provided no statistically

significant support. Additionally, the transformative capital budget had a statistically significant curvilinear relationship with organizational centralization, $\beta = -.213$, $p = .006$ (see Figure 3) providing support for RQ4, which examined whether a curvilinear relationship exists between the leadership focus on innovation and centralization. The relationship reflected that IT centralization was highest when transformative capital budget was moderate. This was the only component that provided support for a curvilinear relationship, while the other financial component of transformative operating budget along with organizational vision and culture perspective did not.

**Prediction of organizational centralization summary.** In review, institutional centralization was higher when transformative capital budget was larger. In addition, a curvilinear relationship between transformative capital budgets and centralization was found, meaning that centralization was highest when the transformative capital budget was moderate (as opposed to high or low). Also, institutions reported lower levels of organizational centralization when the institution was doctoral as opposed to masters. Finally, institutions reported lower levels of centralization when the institution had larger total campus IT budgets.

**Prediction of Defined Governance Processes and Adoption of Technology Standards**

The fourth set of two simultaneous multiple regression analyses evaluated H6, RQ6, H7, and RQ7 and predicted defined governance processes and adoption of technology standards from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation.

**Prediction of defined governance processes.** The combination of variables to predict the adoption of defined governance processes from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership

focus on innovation was statistically significant, $F$ (14, 186) = 5.245, $p < .001$. The beta coefficients are presented in Table 13. The adjusted $R^2$ value was .229. This indicates that approximately 23% of the variance in the adoption of defined governance processes was explained by the model. According to Cohen (1992), this is a medium effect size.

When directly evaluating H6, organizational centralization predicting defined governance processes, no statistically significant support was found. Beta coefficient for the organizational centralization predictor was: $\beta = .117$, $p = .435$. Also, with regards to RQ6, which examined whether a curvilinear relationship exists between organizational centralization and defined governance processes, no support was provided. When directly evaluating H7, two components, leadership focus on innovation from the organizational vision and culture perspective, $\beta = .371$, $p < .001$, and the curvilinear transformative operating budget, $\beta = -.245$, $p = .006$, which indicated that defined governance processes were highest when transformative operating budgets were moderate, supported the hypothesis (see Figure 4). The other financial component of transformative capital budget provided no support. In addition, when evaluating RQ7, whether the leadership focus on innovation had a curvilinear relationship with defined governance processes, the one financial component mentioned above, transformative operating budget, provided the only statistically significant support.

**Prediction of technology standards.** The second and last simultaneous multiple regression explored the combination of variables to predict adoption of technology standards from linear organizational centralization, quadratic organizational centralization, linear leadership focus on innovation, and quadratic leadership focus on innovation was statistically significant, $F$ (14, 185) = 4.579, $p < .001$. The beta coefficients are presented in Table 14. The adjusted $R^2$ value was .201. This indicates that approximately 20% of the variance in the

adoption of technology standards was explained by the model. According to Cohen (1992), this is a medium effect size.

When directly evaluating H6, organization centralization predicting technology standards, no statistically significant support was found. Beta coefficients for the organizational centralization predictor was $\beta$ = -.289, $p$ = .061. Also, with regards to RQ6, which examined whether a curvilinear relationship exists between organizational centralization and adoption of technology standards, no support was provided. When directly evaluating H7, one component, transformative capital budget was significant, $\beta$ = .361, $p$ = .006, supporting the hypothesis. The other financial component of transformative operating budget and the leadership focus on innovation from the organizational vision and culture perspective provided no statistically significant support. In addition, when evaluating RQ7, whether the leadership focus on innovation had a curvilinear relationship adoption of technology standards, no support was discovered.

**Prediction of governance processes and technology standards summary.** To recap, institutions reported higher scores on defined governance processes when leadership focus on innovation was higher. Also, institutional defined governance processes were highest when transformative operating budget was moderate (compared to high and low budgets). Lastly, institutions reported that the adoption of technology standards was highest when transformative capital budget was high.

**Hypotheses and Research Summary**

This section summarizes the dissertation hypotheses and research questions. No support was found for H1, H2, H4, or H6. H3 and H5 were partially supported by the leadership focus on innovation subcomponent of organizational vision and culture perspective. In addition, this

same subcomponent provided support for the area of H7 that represented adoption of governance processes. Lastly, the leadership focus on innovation subcomponent of transformative capital budget provided statistically significant support for predicting the adoption of technology standards. The summary hypotheses findings are presented in Table 15.

With regard to the research questions, no curvilinear relationships were found for RQ1, RQ2, RQ3, and RQ6. A curvilinear relationship between transformative capital budget and IT organizational centralization provided partial support for RQ4. In addition, partial evidence was found supporting a curvilinear relationship between the organizational vision and culture subcomponent of leadership focus on innovation and the responding component of agility along with the transformative operating budget and the aligning component of agility in RQ5. Lastly, a curvilinear relationship was found between the transformative operating budget subcomponent of leadership focus on innovation and the adoption of governance processes in RQ7. The summary research question findings are presented in Table 16.

## Discussion

This section provides an overview of the dissertation. Contributions to organizational agility and innovation research will be discussed. Theoretical and practical implications will be highlighted. Study limitation and future research suggestions will be shared. Finally, a summary will be provided.

### Contributions to Organizational Agility and Innovation Research

**Organizational agility.** The first concept explored in this paper was organizational agility. Organizational agility at the basic level is the ability to sense and respond. However, beyond these fundamental principles, organizations must not only make sense of the data they collect, but apply it in such a way that aligns or enhances existing processes and organizational

structures, while at the same time enabling a continuous learning or improvement step. This sensing and responding requires the fundamental component of communication. At the foundational level, communication is required to drive the organizational direction and adjust course, whereas at the operational level, communication is needed for employee and departmental interaction and consensus building. It is with this premise that the research applied a comprehensive framework of organizational agility theorized by Seo and La Paz (2008) that asserted organizational agility comprises six dimensions: perceive, process, respond, align, learn, and show competence.

With the desire to more clearly understand and explore organizational agility within higher education IT organizations, an existing data set focused solely on these organizations was studied. The initial step of this research study carefully and critically identified a select number of survey variables from the existing Educause CDS survey dataset and aligned these variables with the appropriate dimension of organizational agility by face validity. Later, these survey components and associated agility dimensions were expertly verified via content validity. Following this, an exploratory factor analysis was conducted to verify fit and reliability. These outcome factors, or dimensions of agility, were incorporated as the fundamental stepping stone to this research, in particular when exploring the two empowerment related theories, centralization and leadership focus on innovation and their relationships to organizational agility, speed of technology adoption, and defined governance processes and technical standards.

Unexpectedly, not all six components of organizational agility were identified in the factor analysis, ultimately with two components (perception and processing) converging within one factor. Fundamentally, these two components of perception and processing vary solely in the ability to make sense of the data or knowledge. Perception, at the basic level, simply

involves the reception and collection of raw signals or data points. Processing transitions these raw signals into compressible knowledge that can be acted upon. Upon reexamination of the Educause survey questions representing both factors, it is reasonable to understand why no distinction could be drawn. During the initial phase of assigning questions to a particular factor, special care was paid to distinguishing the concept of data, raw unprocessed noise, from the concept of knowledge, or the interpretation of data into information and the storing and acting upon it. Given the increased attention and awareness of these distinctions by the author and expert panel, a clear delineation appeared to be drawn early in the process. However, from an untrained perspective, and likely more importantly, the overall intent implied from the question set, no likely distinction could be drawn between the questions targeting data and those targeting knowledge. On a positive and influential note, the study confirmed the existence of various factors associated with organizational agility. Additionally, the study identified a baseline set of valid survey questions. This research confirms that organizational agility is broader and more multifaceted than simply sensing and responding.

**Organizational centralization.** The second concept explored in this dissertation is the centralization of resources. The concept of centralization refers to the scope of independence in decision making capabilities. Within an organizational setting, decentralization refers to the independence of decision making not only within an organizational structure, but one that is typically more directly aligned with specific business unit functions. Existing research on centralization supports the theory that decentralized organizations are more agile (Alavi et al., 2014; Scott, 2006) and accepting of new technologies and innovation (Tiwana & Konsynski, 2010) because they can quickly sense and respond to problems that are otherwise overlooked by a large central organization (Sambamurthy & Zmud, 2000). Additionally, highly centralized

organizations have been positively associated with the adoption of core infrastructure, such as defined governance processes and technical standards (Boynton & Zmud, 1987).

Despite the widely-held perspective that organizational centralization is related to organizational agility, technology adoption, and defined governance processes and standards, surprisingly, none of these predictions were supported in this study. Organizational centralization was neither statistically related with the five identified factors of organizational agility, the speed of technology adoption, nor the adoption of defined governance processes and technical standards. However, the study does provide evidence that organizations do not necessarily make determinations based on whether they are centralized or decentralized, but the decisions are based on higher-order strategy involving organizational vision and leadership. In the case of higher education IT organizations, it appears that organizational leaders make decisions surrounding their desire to be innovative and this focus, either from an organizational vision and culture perspective or from various budgeting perspectives, impacts not only organizational agility, speed of technology adoption, and defined governance processes and technical standards, but also, although slightly, how centralized the organization is. This research confirms that leadership focus on innovation does impact organizational agility, speed of technology adoption, and the adoption of defined governance processes and technology standards.

**Leadership focus on innovation.** The third concept explored in this dissertation was leadership focus on innovation. Leadership focus on innovation hypothesizes that employee empowerment and organizational vision and culture strongly contribute to organizational agility. Empowered employees focused on being innovative and cutting edge, which strongly contributes to organizational agility (Kamhawi, 2012). Results from this study support this premise.

Leadership focus on innovation from the organization vision and culture perspective was statistically significant in predicting all five components of organizational agility.

Additionally, leadership focus on innovation hypothesizes that leadership enables an organization to be open and receptive to new technologies by empowering employees to explore new ideas and implement new technologies. Within this dissertation, this finding was supported. Once again, organizational leadership focus on innovation from an organizational vision and culture perspective statistically predicted speed of technology adoption.

Moreover, existing research supports the concept that innovation, although crucial for organizational success, heavily relies on institutional financial support and organizational vision. Organizations that are focused on innovation leverage defined standards and processes to streamline core operations while enabling and further encouraging innovation. This dissertation found that leadership focus on innovation from the subcomponents of organizational vision and culture and curvilinear transformative operating budgets supported defined governance processes while the subcomponent of transformative capital budgets supported adoption of technology standards. In simpler terms, leadership focus on innovation from an organizational vision and day to day budgeting processes predicted defined governance processes, while larger, longer range capital budgets predicted the adoption of organizational IT service catalogs or technical standards.

Furthermore, research indicates that institutional support for innovation is funded by extremely volatile budgets. During periods of economic slowdowns, organizations focus more on maintaining core IT infrastructure and the associated staff, in many ways contracting the organization and becoming more centralized, than on empowering business unit organizations to explore and enhance technologies that enable competitive advantages. Although existing

evidence suggests organizations that have the financial capabilities and desire to support innovation are less centralized (Mathiassen & Pries-Heje, 2006), predicting a negative relationship between innovation focus and centralization, the evidence uncovered in this study suggests that the opposite occurs. Organizations that reported higher amounts of innovation focus, based on long term financials, reported higher amounts of centralization. Remarkable however, this finding provides supporting evidence that Morgan's (2004) IT paradox may be at play. Meaning, that although organizations desire to be innovative, during times of financial crises, they actually constrict, streamline, and sustain core organizational structure and prioritize critical infrastructure investments rather than truly empower the individual business units with staff and financial flexibility (Ash & Goslin, 1997; Lin & Lin, 2010).

Contributions to the study and exploration of leadership focus on innovation are the broadest reaching. In general, the impact of leadership focus on innovation from the organizational culture and vision perspective was most impactful, predicting all five factors of organizational agility, the speed of technology adoption, and defined governance processes. Similar to the above contributions, the discovery and identification of defined and validated innovation questions that represent organizational vision and culture perspective, ultimately provide a monumental stepping stone for the understanding and measurement of innovation.

**Theoretical Implications**

Three important theoretical implications can be drawn from this dissertation. First, the dissertation provides support for the agility framework developed by Seo and LaPaz (2008), which defined six components of organizational agility: perception, processing, responding, aligning, learning, and competencies. Within this dissertation, the agility components of perception and processing converged within one component rather than the theorized two. As

mentioned above, this may have potentially occurred because of the distinctions drawn between these two components by the expert panel which were ultimately not observed by the survey participants. However, even with this discovery, the proposed organizational agility framework and associated survey questions, which were shown to be valid and reliable, provides initial starting points for future investigations of organizational agility.

Second, although organizational centralization was widely believed to be a strong predictor of not only organizational agility, but the speed of technology adoption and the adoption of defined governance processes and technical standards, the findings from this research did not support these conceptions. However, an important theoretical contribution is highlighted with this discovery. The results indicate that leadership focus on innovation is a far better predictor of not only organizational agility, speed of technology adoption, and the adoption of defined governance processes and standards, but of organizational centralization as well. This would hypothesize that although organizational centralization may appear to be tightly coupled with these various innovation and agility outcomes, potentially from the visibility organizational boundaries and relationships have within an organization, other factors are at play that are less visible, such as overall organizational vision and culture. This further supports Weick's (1976) theoretical belief that individuals are far more willing to incorrectly attribute tight coupling of system inputs and outputs than those that are less visible.

The last theoretical implication is the discovery of the broad impact leadership focus on innovation has. The study identified a series of survey questions that were ultimately shown to be valid and reliable in exploring leadership focus on innovation from a converged perspective representing organization vision and culture. Furthermore, that this organizational vision and culture perspective was widely linked to predicting organizational agility, speed of technology

adoption, defined governance processes, and including IT organizational centralization. This discovery insinuates that organizational vision and culture could potentially have a more impactful effect on linking of the components than the previously held belief of decisions surrounding organizational structure. Simply put, these findings challenge the existing perspective that organizational centralization is strongly associated with organizational agility (Ahmadi et al., 2012), speed of technology adoption (Mathiassen & Pries-Heje, 2006), and the adoption of defined governance processes and technology standards (Boynton & Zmud, 1987).

**Practical Implications**

Several practical implications can be drawn from the study. First, high-level organizational strategy and vision can significantly predict various components associated with organizational agility, speed of technology adoption, defined processes and technical standards, in addition to the organizational structures. This supports the belief by Goduscheit (2014) that organizational innovation requires champions, gatekeepers, and promoters to successfully drive change and innovation throughout an enterprise. A significant practical implication is the need for clear articulation and widespread promotion of the overall innovation vision and strategy. This could be accomplished at the organizational level by including the desired focus in the mission and vision statements of the organization and within various organizational and departmental strategic plans. Furthermore, at a more operational level, various supporting components could be included in departmental and staff goal development and performance management practices. This practical approach is further reinforced in the Educause survey questions representing innovation, such as: innovation drives the vision of the organization, innovation has a shared sense of purpose, innovation is encouraged, teams expect to innovate, leader prioritize innovation, etc. From this perspective, the successful and clear articulation of

the organizational vision and goals surrounding innovation could not only ultimately impact organizational team members' understanding of the organizational mission and vision, but the adoption of broader processes and concepts associated with innovation.

A second practical implication is that although the leadership focus on innovation subcomponent of culture and vision perspective can predict organizational agility, speed of technology adoption, and defined governance processes and technology standards, this subcomponent was not significant when predicting organizational centralization, but a different subcomponent was. The subcomponent of transformative capital budget was a statistically significant predictor of organizational centralization, although in a direction opposite of the one hypothesized. In addition, the curvilinear transformative capital budget was even more statistically significant at predicting organizational centralization. The practical outcome is that, although broadly speaking, leadership focus on innovation successfully predicts various components of agility and technology adoption, organizational centralization was more significantly predicted, in the opposite direction than what was hypothesized, from the capital budget perspective than the vision and culture perspective. While this further supports Orton and Weick's (1990) concept of loosely coupled system perspective, the applied concept further highlights impact on organizational structure. Even further, it provides partial support for the IT paradox in three ways (Morgan, 2004). First, that organizational centralization is more significantly predicted by financial circumstances regarding innovation rather than the articulation of innovation vision and culture and creating an organizational that can promote and sustain the necessary activities. Second, this may further support or influence the perspective that organizational centralization is driven by motives other than the desire to be innovative and agile, but those that reflect power and control affiliations (Thompson & McHugh, 2003). Third,

that although organizations are increasing the innovation budget from the financial perspective, they're constricting the flexibility from the organizational structure perspective. In the end, these practical implications further challenge the various IT leadership roles responsible for building a cohesive organization that balances the independence of local structures with those more rigid, higher-level organizational frameworks, often associated with loosely coupled systems (Orton & Weick, 1990).

Lastly, and related to the above findings, the third practical implication is that despite the existing findings that organizational centralization predicts not only agility (Ahmadi et al., 2012; Wade & Buechel, 2013), but speed of technology adoption (Mathiassen & Pries-Heje, 2006) and defined governance processes and technology standards (Kastrul, 2008), this research did not support this concept in higher education organizations. The practical implication is that despite the importance, interest, and clear visibility associated with the various spectrums of organizational reporting structures, they don't necessarily predict organizational innovation and agility. This finding heightens the need for leadership to more carefully understand, interpret, and manage employee expectations and needs with those of the organization. More specifically, it reinforces the need for leaders to be cognizant of the employee perspective of "What's in it for me?" by which leaders need to focus on building a climate of trust and ensuring positive communication to see adoption of organization vision and goals (Vakola, 2014). Leaders not only need to articulate the benefits of organizational agility and innovation adoption from the organizational perspective, they need to articulate these benefits from the employee perspective as well. This concept is even more important in a loosely coupled system, such as higher education IT organizations, whereby multiple and sometimes contradictory leadership roles and organizational goals exist. In these situations, employees need to more completely understand

and acknowledge sometimes more broad, peculiar, or loosely associated relationships, responsibilities, and reporting structures than those that exist in traditionally tightly bound enterprises.

**Limitations**

This study has several limitations. First, although agility is well understood as having two fundamental core principles, sensing and responding, little agreement exists in the definition and application of agility principles within various environments. For the purposes of this study, a conceptual framework consisting of six organizational agility components was used to explore data within an existing survey data set. This limitation was diminished by not only utilizing face validity to identify appropriate measures, but expert reviews to ensure content validity. However, in the end, the existing survey data set was not necessarily designed to measure and explore the core components of this research, the six dimensions of organizational agility. This limitation could have impacted the discovery of only five of the six organizational agility components.

Second, despite the vastness and depth of the Educause CDS data, there are some specific limitations that exist with the data. First, the data is self-reported by members of their respective organizations that have chosen to participate in the Educause community and data collection processes. Although Educause members and nonmembers are able to participate in the yearly survey, there is a self-inflicted floor to the data set. This floor could be introduced because an institution may be unable to afford the yearly Educause membership fee and thus do not actively participate in the community and lack an understanding of the yearly survey processes and steps. Or the institution may be aware of the process, but lack the willingness to complete the additional steps needed to participate as a non-member. Second, Educause does warn that the

report focuses heavily on central IT organizations and that data on distributed resources and funding allocations remain elusive (Lang, 2016). This limitation was lessened somewhat by excluding pairwise cases when exploring each of the specific statistical calculations. Lastly, care must be taken to recognize that the Educause survey approach relies on an organization nominating a single person to oversee the survey data collection for the specific institution and these individuals usually report up to the CIO. Although campus representatives can reassign specific sections of the survey to various colleagues throughout the organization, the primary module used for collecting core budget and staffing information, along with the speed of technology adoption, will likely be completed by a staff member that typically reports through the central IT organization. Because of this, it should be noted that some form of social desirability bias could be introduced or in some cases, responses may not accurately or directly relate to an organizational wide view of agility, but rather a centralized view. Despite these limitations regarding the data and survey method, the existing survey data does provide a direct representative sample of higher education IT organizations.

Third, limitations exist from a statistical standpoint. First and foremost, although regressions are predictive and enable the understanding of variance, they do not prove causations (Field, 2005; Pedhazur, 1997). Special care should be taken to avoid making assumptions between which variables came first, causal relationships between the variables, or the exclusion of confounding variables not under the study control. Second, the study was not an experimental design, but an exploration of an existing data set hypothesized by a theoretical model of organizational agility. Third, the use of exploratory factor analysis is only a first step in understanding and identifying a theoretical framework and this concept should be further explored by confirmatory factor analysis in similar and more robust studies in future research.

Despite these limitations, the study attempts to accurately explore the highly-understudied field of organizational agility and related employee empowerment concepts within an established theoretical framework. This research provided the first step in identifying the high-level components of agility and future research should expand on the findings with more rigid statistical measures and experimental designs. The next section will propose future research.

**Future Research**

Several interesting findings can be drawn from this dissertation necessitating future empirical examinations. First, the study identified several measures for the various components of organizational agility. Future research should explore these measures from a confirmatory factor analysis perspective. A similar examination should be conducted for the leadership focus on innovation subcomponent of vision and culture perspective set of questions.

Second, the examination of agility within higher education IT organizations is simply a small sliver of the tremendously vast network of loosely coupled organizations and institutions. The exploration of these various other markets that represent loosely coupled systems or organizations would further enhance the knowledge of organizational agility and the drivers for success. Some of the more prevalent organizational structures worthy of consideration could include research and innovation centers such as pharmaceutical drug companies, technology focused organizations such as software and hardware manufactures, and consumer technologies. Other research opportunities certainly exist in the healthcare field, such as medical care, innovation and treatment discovery, and patient client technologies. Lastly, other research opportunities certainly exist within the public sector, including local, state, and federal government.

Lastly, organizational agility, speed of technology adoption, and the adoption of defined governance processes and standards represent unscientific and very loosely defined terms that allow for wildly different interpretations. Future research should begin to narrow down graduated and adopted scales or measures for these specific components. As agility becomes more important for future organizational success and survival, a standardized measurement scale or maturity model for innovation is instrumental in organizations determining their unbiased perspective of organizational attainment and opportunities for improvement.

**Conclusions**

Four conclusions can be drawn from this study. First, five of the six dimensions of organizational agility were identified and quantified within the existing Educause CDS data set. The Educause data set revealed a close alignment between the exploratory factors and related survey questions within the proposed six-dimensional framework of organization agility, with one small delineation in that the organizational agility factors of perception and processing converged within one component. Although a six-dimensional framework of organizational agility would have provided a more detailed picture of the relationships that potentially exists between organizational agility with centralization and leadership focus on innovation, the five-component framework still provided an excellent perspective to explore and understand the topics at hand.

Second, the dissertation provided the first opportunity to explore relationships that exist between leadership focus on innovation, organizational centralization, and three theoretical concepts: organizational agility, the speed of technology adoption, and defined governance processes and technical standards. Surprisingly, the research did not provide support to the theory that organizational centralization is negatively related with organizational agility.

Additionally, although somewhat counterintuitive, prior research indicates that organizational centralization is negatively related to the speed of technology adoption. Unfortunately, these findings were not supported in this research. Organizational centralization was not statistically related to the speed of technology adoption. Furthermore, organizational centralization was not determined to be related to defined governance processes and adoption of technical standards.

Third, this dissertation provided the first opportunity to explore the relationships that exist between leadership focus on innovation and three concepts: organizational agility, the speed of technology, and defined governance processes and technical standards. Quite remarkably, leadership focus on innovation had statistically significant positive relationships with all five components of agility. Also, as expected, a positive relationship exists between leadership focus on innovation and the speed of innovation. It was also hypothesized that leadership focus on innovation would positively predict defined governance standards and this was supported by two perspectives, leadership focus on innovation from the organizational vision and culture perspective and the curvilinear transformative operating budget. Finally, the adoption of technical standards, or service catalog adoption was positively predicted by transformative capital budget.

Fourth, this dissertation explored the relationship that exists between leadership focus on innovation and IT organizational centralization. It was expected that a negative relationship would exist between leadership focus on innovation and the proportion of IT centralization, however findings suggested the opposite occurs. Meaning, that as the focus of innovation from a long term financial perspective increases, the proportion of IT organizational centralization increased as well, providing partial support for the IT paradox (Morgan, 2004).

In summary, this dissertation evaluated the relationship that leadership focus on innovation and organizational centralization has with three critically important concepts: organizational agility, speed of technology adoption, and defined governance processes and adoption of technical standards. Although IT organizational centralization was not a strong predictor of any of these three concepts, leadership focus on innovation proved to be. Additionally, leadership focus on innovation predicted IT organizational centralization, albeit in a way opposite than what was hypothesized.

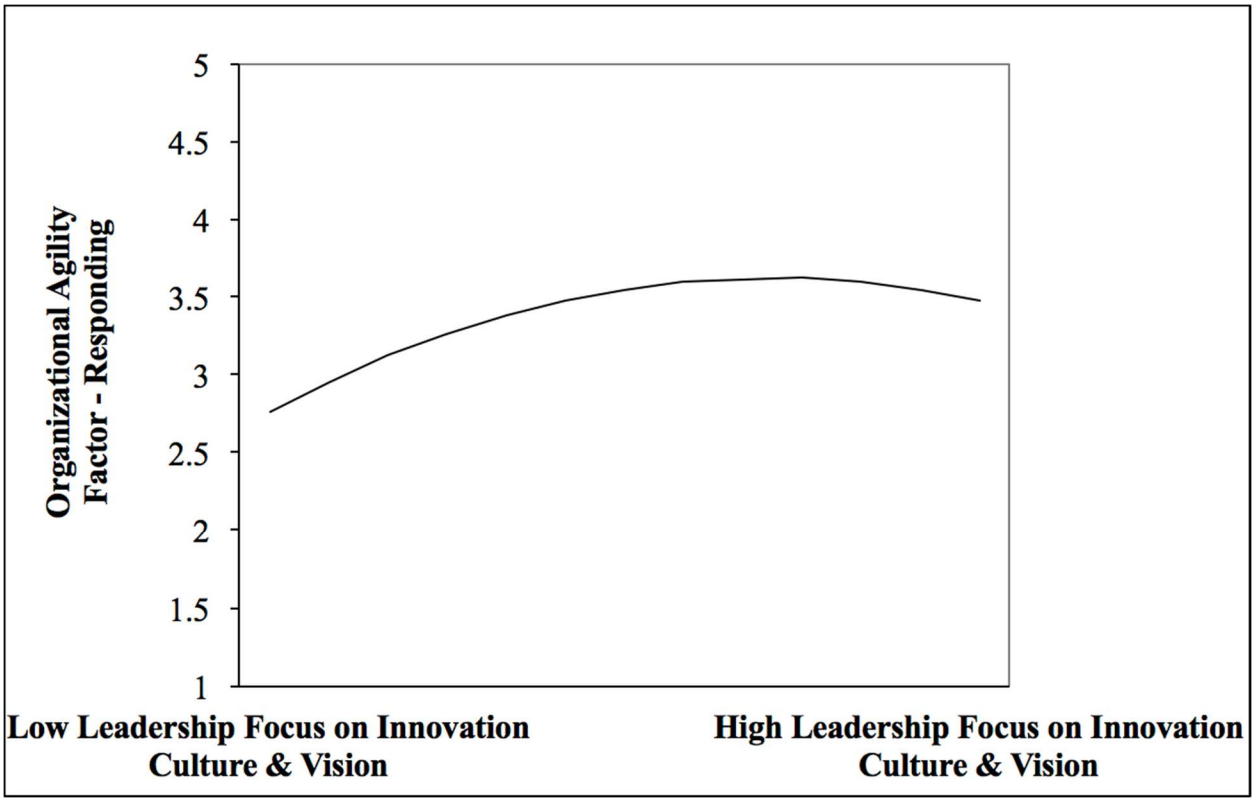


*Figure 1.* Curvilinear relationship that exists between leadership focus on innovation culture and vision and the organizational agility factor of responding.

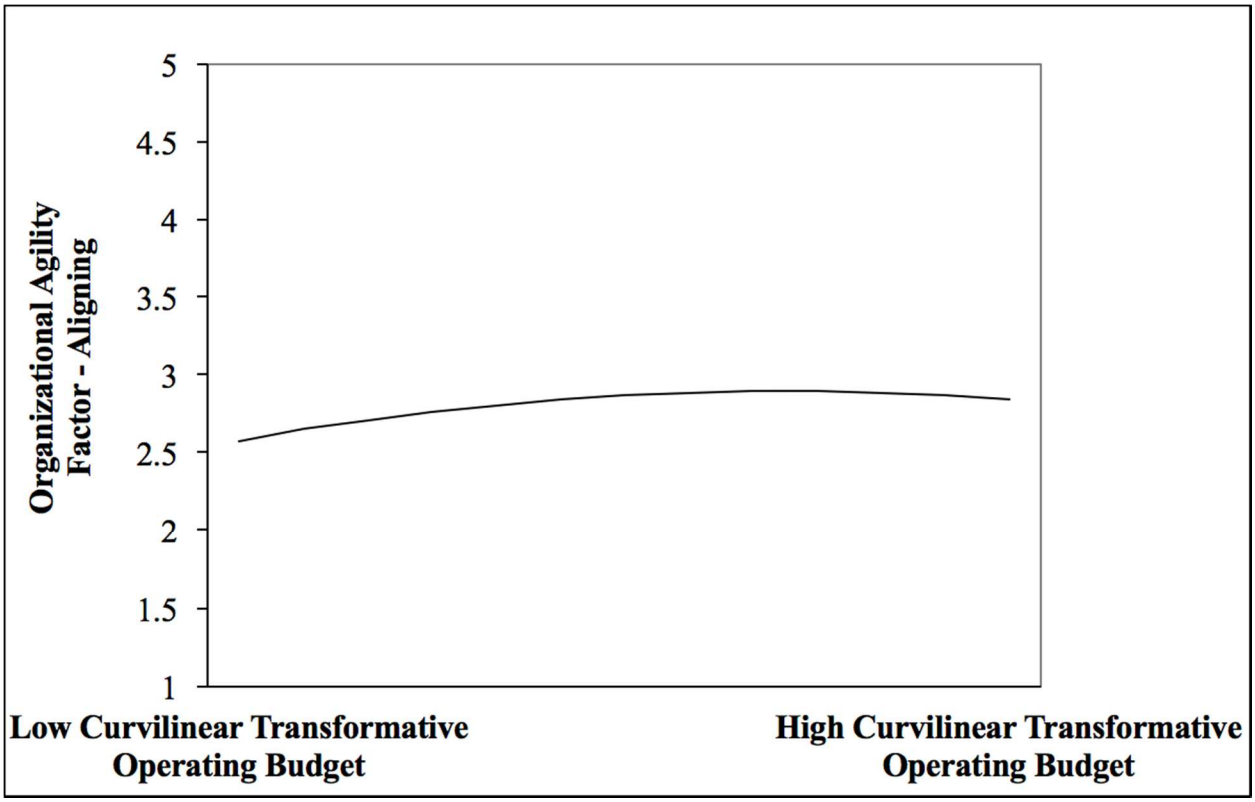


*Figure 2.* Curvilinear relationship that exists between transformative operating budget and the organizational agility factor of aligning.

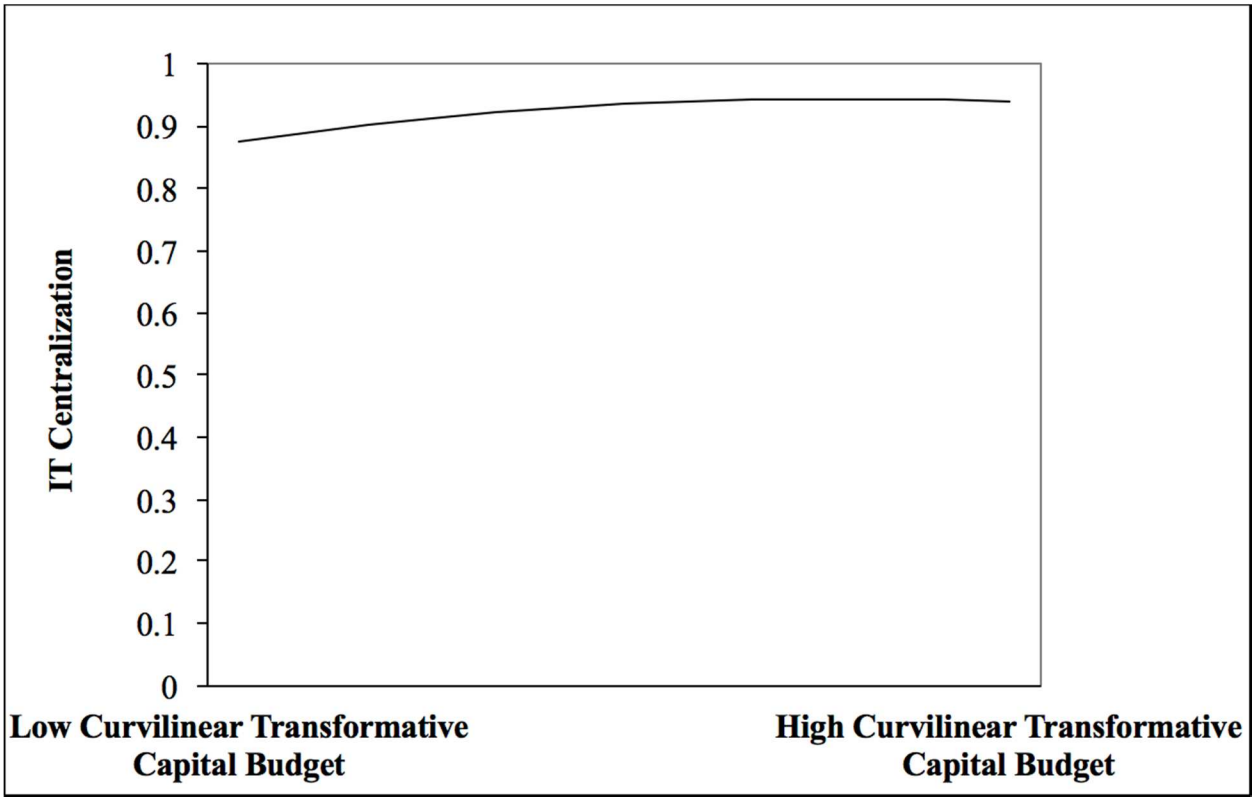


*Figure 3.* Curvilinear relationship that exists between transformative capital budget and organizational centralization.

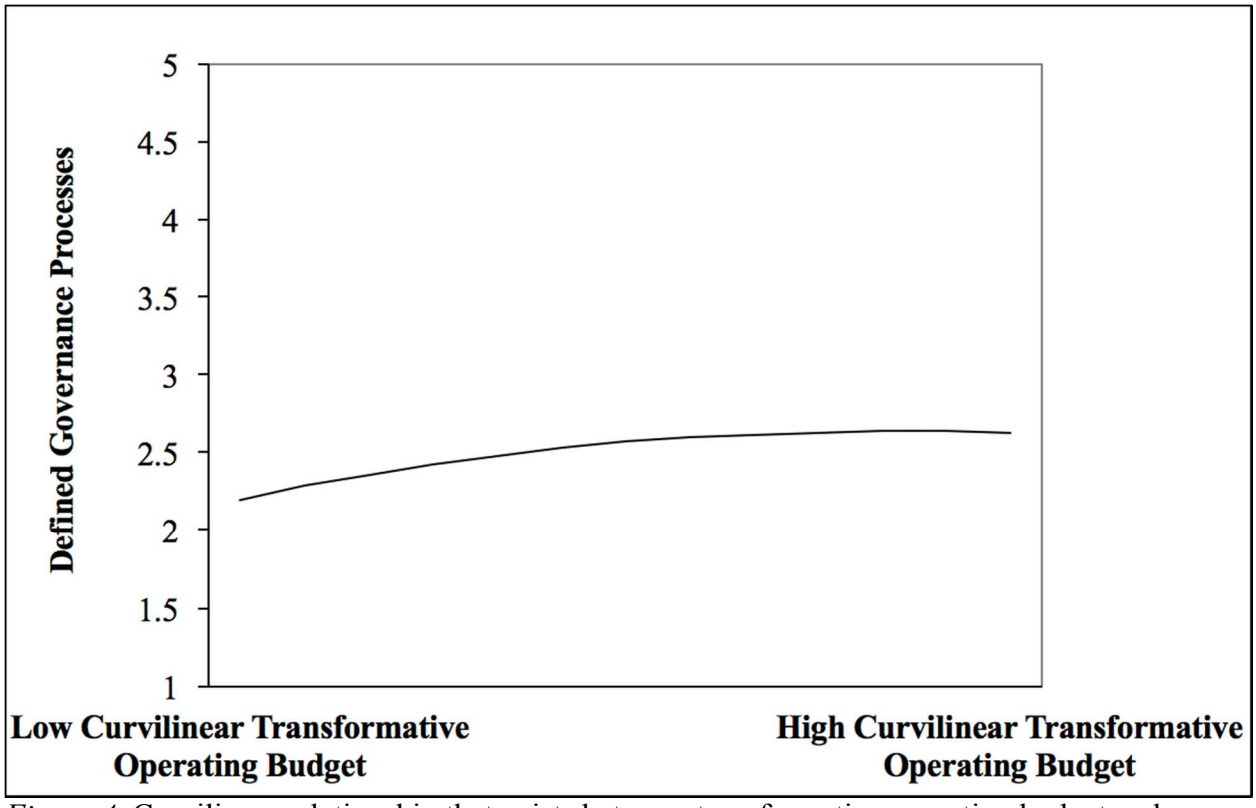


*Figure 4.* Curvilinear relationship that exists between transformative operating budget and defined governance processes.

Table 1

Educause survey component factor loadings

| *Original Factor Assignment* | *Factor 1 Perception & Processing* | *Factor 2 Responding* | *Factor 3 Aligning* | *Factor 4 Learning* | *Factor Competencies* |
|---|---|---|---|---|---|
| PerceptionQ1 | 0.75 | | | | |
| PerceptionQ2 | 0.76 | | | | |
| PerceptionQ3 | 0.80 | | | | |
| PerceptionQ4 | 0.70 | | | | |
| ProcessingQ1 | 0.58 | | | | |
| ProcessingQ2 | 0.65 | | | | |
| ProcessingQ5 | 0.39 | | | | |
| RespondingQ3 | | 0.68 | | | |
| AligningQ6 | | 0.74 | | | |
| CompetenciesQ5 | | 0.73 | | | |
| CompetenciesQ6 | | 0.75 | | | |
| AligningQ1 | | | 0.84 | | |
| AligningQ2 | | | 0.91 | | |
| AligningQ3 | | | 0.90 | | |
| AligningQ5 | | | 0.82 | | |
| RespondingQ5 | | | | 0.82 | |
| AligningQ4 | | | | 0.82 | |
| LearningQ1 | | | | 0.80 | |
| LearningQ2 | | | | 0.84 | |
| LearningQ3 | | | | 0.85 | |
| ProcessingQ3 | | | | | 0.62 |
| ProcessingQ4 | | | | | 0.55 |
| RespondingQ1 | | | | | 0.63 |
| RespondingQ2 | | | | | 0.69 |
| RespondingQ4 | | | | | 0.51 |
| CompetenciesQ1 | | | | | 0.71 |
| CompetenciesQ2 | | | | | 0.49 |
| CompetenciesQ3 | | | | | 0.70 |
| CompetenciesQ4 | | | | | 0.62 |
| Eigenvalue | 3.76 | 2.99 | 3.26 | 3.68 | 4.16 |
| Percentage of variance explained | 12.97 | 10.31 | 11.25 | 12.68 | 14.33 |
| Cronbach's alpha | .83 | .82 | .92 | .90 | .85 |

*Note.* Principal Component Analysis. Varimax rotation with Kaiser Normalization.

Table 2

Innovation question factor loadings

| *Survey Question* | *Factor 1* |
|---|---|
| 1. The organization has developed, communicated and invested in clear support strategies. Explicit learning budgets exist and innovation time is built into schedules. (m1q11_5_4_2015) | 0.83 |
| 2. Senior leaders recognize the importance of a growth mindset, and regularly take public risks in pursuit of bold outcomes. This willingness to take risks is recognized and celebrated. (m1q11_5_1_2015) | 0.84 |
| 3. The organization has established agreed-upon processes to promote, support, and reward innovation, which are communicated clearly and consistently. (m1q11_4_2_2015) | 0.85 |
| 4. Vision: A focus on innovation drives the vision of the organization which is explicitly linked to students' needs. Participants at all levels can articulate the vision. (m1q11_1_1_2015) | 0.87 |
| 5. Purpose: Innovation efforts have a clear, shared sense of purpose. Strategies are developed, documented and implemented with the learning benefit being shared across the organization. (m1q11_1_2_2015) | 0.86 |
| 6. Permission: Innovation is explicitly encouraged, celebrated and studied across the organization. All members of the organization feel empowered to design and try new approaches. (m1q11_1_3_2015) | 0.88 |
| 7. Routine: Teams expect to innovate continually and have a developed clear, shared routines for doing so, which are continually iterated upon and improved, as needed. (m1q11_1_4_2015) | 0.85 |
| 8. Urgency: Leaders not only explicitly prioritize innovation, but they establish clear expectations and timelines as the basis for making organizational progress. (m1q11_1_5_2015) | 0.86 |
| 9. Trade-offs: Innovation is frequently prioritized in decision-making because it is a strong organizational value. Trade-offs that make innovation possible are transparent and explicitly shared (m1q11_1_6_2015) | 0.83 |
| 10. Champion: Leaders at multiple levels of the organization champion and are held accountable for creating environments that promote innovation, risk-taking and new approaches. (m1q11_2_3_2015) | 0.79 |
| 11. Team: The organization consistently invests in its capacity to innovate and broadly communicates this value. Leaders are held accountable to develop their teams' capacity to innovate. (m1q11_3_1_2015) | 0.84 |
| Eigenvalue | 7.84 |
| Percentage of variance explained | 71.30 |
| Cronbach's alpha | .96 |

*Note.* Principal Component Analysis. Varimax rotation with Kaiser Normalization.

Table 3

15 *United States higher education systems and count of institutional participation*

| *Higher Education System* | *Count of Institutional Participation* |
|---|---|
| City University of New York (CUNY) | 1 |
| University System of Ohio | 9 |
| California State University | 14 |
| State University of New York | 17 |
| University System of Georgia | 18 |
| State University System of Florida | 9 |
| University of California | 1 |
| Technology College System of Georgia | 0 |
| University of Texas System | 13 |
| Utah System of Higher Education | 4 |
| University of North Carolina | 7 |
| University of Wisconsin System | 8 |
| University System of Maryland | 7 |
| Texas A&M University System | 12 |
| Pennsylvania System of Higher Education | 4 |

Table 4

*Check for nonindependence of observation*

| *Variable* | *Intraclass Correlation* |
|---|---|
| InnovationAveraged | 0 |
| FactorPerceptionandProcessing | .038 |
| FactorResponding | .090 |
| FactorAligning | 0 |
| FactorLearning | 0 |
| FactorCompetencies | .103 |
| ITCentralizationAveraged | .246 |
| BudgetTransformCapital | 0 |
| BudgetTransformOperating | .038 |
| SpeedofTechAdoption | .025 |
| GovernanceTechStandardsServices | .014 |
| ServiceCatalog | .085 |

Table 5

*Pairwise correlations between study variables*

| Variable | | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* | *13* | *14* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Innovation Averaged | | | | | | | | | | | | | | | |
| | *N* | 632 | | | | | | | | | | | | | |
| 2. Factor – Perception & Processing | | .19** | | | | | | | | | | | | | |
| | *N* | 428 | | | | | | | | | | | | | |
| 3. Factor – Responding | | .28** | .45** | | | | | | | | | | | | |
| | *N* | 428 | 556 | | | | | | | | | | | | |
| 4. Factor – Aligning | | .44** | .17** | .26** | | | | | | | | | | | |
| | *N* | 630 | 540 | 540 | | | | | | | | | | | |
| 5. Factor – Learning | | .89** | .16** | .24** | .41** | | | | | | | | | | |
| | *N* | 620 | 427 | 427 | 629 | | | | | | | | | | |
| 6. Factor - Competencies | | .25** | .56** | .63** | .28** | .23** | | | | | | | | | |
| | *N* | 428 | 556 | 556 | 540 | 427 | | | | | | | | | |
| 7. IT Centralization Averaged | | 0.01 | 0.06 | -0.05 | 0.06 | 0.03 | -0.07 | | | | | | | | |
| | *N* | 329 | 257 | 257 | 385 | 327 | 257 | | | | | | | | |
| 8. Budget Transform Capital | | 0.07 | -0.07 | -0.01 | .12** | 0.04 | 0.07 | -0.04 | | | | | | | |
| | *N* | 411 | 342 | 342 | 506 | 413 | 342 | 262 | | | | | | | |
| 9. Budget Transform Operating | | .28** | 0.08 | 0.08 | .19** | .21** | .14** | 0.03 | .29** | | | | | | |
| | *N* | 470 | 382 | 382 | 575 | 472 | 382 | 295 | 487 | | | | | | |
| 10. Governance Process | | .40** | .20** | .21** | .76** | .36** | .25** | 0.06 | 0.07 | .19** | | | | | |
| | *N* | 632 | 541 | 541 | 799 | 630 | 541 | 386 | 506 | 576 | | | | | |
| 11. Technology Standards | | .17** | 0.05 | 0.02 | .20** | .17** | .12** | -.31** | .18** | .08* | .14** | | | | |
| | *N* | 630 | 546 | 546 | 798 | 629 | 546 | 389 | 510 | 581 | 799 | | | | |
| 12. Speed of Technology Adoption | | .39** | .17** | .13** | .31** | .32** | .20** | 0.02 | 0.04 | .20** | .27** | .18** | | | |
| | *N* | 631 | 545 | 545 | 799 | 630 | 545 | 389 | 508 | 579 | 800 | 809 | | | |
| 13. Student FTE Count | | .13** | -0.04 | 0.06 | 0.06 | .10* | 0.06 | -.70** | 0.04 | -0.01 | 0.00 | .36** | .08* | | |
| | *N* | 575 | 503 | 503 | 726 | 575 | 503 | 359 | 469 | 535 | 727 | 737 | 736 | | |
| 14. Total Campus IT Budget | | 0.07 | -0.05 | 0.08 | 0.00 | 0.03 | .12* | -.70** | 0.01 | -0.05 | -0.01 | .24** | 0.05 | .71** | |
| | *N* | 339 | 265 | 265 | 403 | 337 | 265 | 388 | 276 | 313 | 404 | 407 | 407 | 374 | 409 |

*$p < .05$, **$p < .01$.

Table 6

*Simultaneous multiple regression summary - agility factor – perception and processing - for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | 0.355 | 0.351 | 0.091 | 1.011 |
| Dummy Variable 2 – Associates | 0.046 | 0.162 | 0.03 | 0.286 |
| Dummy Variable 3 – Baccalaureate | 0.024 | 0.168 | 0.014 | 0.142 |
| Dummy Variable 4 – Doctoral | 0.491 | 0.215 | 0.295* | 2.284 |
| Student FTE Count | 5.98E-06 | 0 | 0.09 | 0.739 |
| Total IT Campus Budget | -7.91E-10 | 0 | -0.037 | -0.258 |
| Predictor Variables | | | | |
| IT Centralization | 1.42 | 0.863 | 0.321 | 1.645 |
| IT Centralization – Quadratic | 0.901 | 2.451 | 0.062 | 0.368 |
| Budget Transform Operating | -0.005 | 0.011 | -0.059 | -0.436 |
| Budget Transform Operating – Quadratic | 0 | 0 | 0.139 | 1.174 |
| Budget Transform Capital | 0.002 | 0.006 | 0.074 | 0.435 |
| Budget Transform Capital – Quadratic | -9.92E-05 | 0 | -0.158 | -0.968 |
| Innovation Focus | 0.172 | 0.081 | 0.265* | 2.123 |
| Innovation Focus – Quadratic | 0.004 | 0.052 | 0.01 | 0.082 |
| Constant | 3.054 | .150 | | 20.385 |

*Note.* Dependent variable: agility factor of perception and processing.

$R^2 = .097$; $F\ (14, 114) = 1.983$, $p = .025$.

*$p < .05$, **$p < .01$.

Table 7

*Simultaneous multiple regression summary – agility factor – responding for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | -0.617 | 0.422 | -0.127 | -1.463 |
| Dummy Variable 2 – Associates | 0.278 | 0.195 | 0.144 | 1.425 |
| Dummy Variable 3 – Baccalaureate | 0.011 | 0.202 | 0.005 | 0.052 |
| Dummy Variable 4 – Doctoral | 0.186 | 0.259 | 0.09 | 0.72 |
| Student FTE Count | 1.32E-05 | 0 | 0.159 | 1.352 |
| Total IT Campus Budget | -1.33E-09 | 0 | -0.051 | -0.361 |
| Predictor Variables | | | | |
| IT Centralization | 0.297 | 1.037 | 0.054 | 0.286 |
| IT Centralization – Quadratic | 0.516 | 2.945 | 0.029 | 0.175 |
| Budget Transform Operating | 0.016 | 0.013 | 0.165 | 1.266 |
| Budget Transform Operating – Quadratic | 7.58E-05 | 0 | 0.02 | 0.175 |
| Budget Transform Capital | 0 | 0.007 | 0.006 | 0.039 |
| Budget Transform Capital – Quadratic | -5.81E-05 | 0 | -0.075 | -0.472 |
| Innovation Focus | 0.351 | 0.098 | 0.436** | 3.598 |
| Innovation Focus – Quadratic | -0.171 | 0.062 | -0.321** | -2.729 |
| Constant | 3.439 | .180 | | 19.109 |

*Note.* Dependent variable: agility factor of responding.

$R^2 = .151$; $F\ (14, 114) = 2.625$, $p = .002$.

*$p < .05$, **$p < .01$.

Table 8

*Simultaneous multiple regression summary – agility factor – aligning for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | 0.259 | 0.337 | 0.05 | 0.767 |
| Dummy Variable 2 – Associates | -0.091 | 0.186 | -0.038 | -0.487 |
| Dummy Variable 3 – Baccalaureate | -0.292 | 0.185 | -0.119 | -1.573 |
| Dummy Variable 4 – Doctoral | -0.043 | 0.274 | -0.015 | -0.156 |
| Student FTE Count | -2.60E-06 | 0 | -0.024 | -0.243 |
| Total IT Campus Budget | 2.05E-09 | 0 | 0.068 | 0.533 |
| Predictor Variables | | | | |
| IT Centralization | 1.624 | 1.034 | 0.228 | 1.571 |
| IT Centralization – Quadratic | 2.742 | 2.84 | 0.131 | 0.965 |
| Budget Transform Operating | 0.011 | 0.012 | 0.084 | 0.876 |
| Budget Transform Operating – Quadratic | -0.001 | 0 | -0.203* | -2.375 |
| Budget Transform Capital | 0.006 | 0.006 | 0.12 | 0.937 |
| Budget Transform Capital – Quadratic | 1.82E-06 | 0 | 0.002 | 0.018 |
| Innovation Focus | 0.542 | 0.092 | 0.51** | 5.914 |
| Innovation Focus – Quadratic | -0.006 | 0.06 | -0.008 | -0.095 |
| Constant | 2.865 | .182 | | 15.742 |

*Note.* Dependent variable: agility factor of aligning.

$R^2 = .277$; $F\ (14, 185) = 6.447$, $p < .001$.

*$p < .05$, **$p < .01$.

Table 9

*Simultaneous multiple regression summary – agility factor – learning for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | 0.356 | 0.162 | 0.08* | 2.196 |
| Dummy Variable 2 – Associates | 0.126 | 0.091 | 0.06 | 1.388 |
| Dummy Variable 3 – Baccalaureate | 0.201 | 0.089 | 0.095* | 2.257 |
| Dummy Variable 4 – Doctoral | 0.039 | 0.133 | 0.016 | 0.291 |
| Student FTE Count | 5.16E-06 | 0 | 0.054 | 0.958 |
| Total IT Campus Budget | -8.10E-10 | 0 | -0.031 | -0.432 |
| Predictor Variables | | | | |
| IT Centralization | -0.024 | 0.501 | -0.004 | -0.047 |
| IT Centralization – Quadratic | 0.27 | 1.367 | 0.015 | 0.198 |
| Budget Transform Operating | -0.003 | 0.006 | -0.027 | -0.513 |
| Budget Transform Operating – Quadratic | 0 | 0 | 0.034 | 0.711 |
| Budget Transform Capital | 0 | 0.003 | 0.004 | 0.062 |
| Budget Transform Capital – Quadratic | -5.26E-05 | 0 | -0.072 | -1.053 |
| Innovation Focus | 0.791 | 0.045 | 0.847** | 17.766 |
| Innovation Focus – Quadratic | 0.038 | 0.029 | 0.059 | 1.296 |
| Constant | 1.963 | .088 | | 22.406 |

*Note.* Dependent variable: agility factor of learning.

$R^2 = .782$; $F\ (14, 181) = 50.983$, $p < .001$.

*$p < .05$, **$p < .01$.

Table 10

*Simultaneous multiple regression summary – agility factor – competencies for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | -0.213 | 0.36 | -0.052 | -0.593 |
| Dummy Variable 2 – Associates | -0.116 | 0.166 | -0.071 | -0.699 |
| Dummy Variable 3 – Baccalaureate | -0.065 | 0.172 | -0.037 | -0.378 |
| Dummy Variable 4 – Doctoral | 0.202 | 0.221 | 0.115 | 0.913 |
| Student FTE Count | 9.37E-06 | 0 | 0.134 | 1.128 |
| Total IT Campus Budget | 1.41E-09 | 0 | 0.063 | 0.448 |
| Predictor Variables | | | | |
| IT Centralization | 1.606 | 0.885 | 0.346 | 1.815 |
| IT Centralization – Quadratic | 3.054 | 2.513 | 0.202 | 1.215 |
| Budget Transform Operating | 0.011 | 0.011 | 0.128 | 0.973 |
| Budget Transform Operating – Quadratic | 0 | 0 | 0.042 | 0.365 |
| Budget Transform Capital | 0.004 | 0.006 | 0.124 | 0.741 |
| Budget Transform Capital – Quadratic | -9.42E-05 | 0 | -0.143 | -0.897 |
| Innovation Focus | 0.261 | 0.083 | 0.382** | 3.133 |
| Innovation Focus – Quadratic | -0.076 | 0.053 | -0.169 | -1.426 |
| Constant | 3.036 | .154 | | 19.762 |

*Note.* Dependent variable: agility factor of competencies.

$R^2 = .138$; $F\ (14, 114) = 2.468$, $p = .004$.

*$p < .05$, ** $p < .01$.

Table 11

*Simultaneous multiple regression summary – speed of technology adoption for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | -0.397 | 0.259 | -0.099 | -1.533 |
| Dummy Variable 2 – Associates | -0.205 | 0.143 | -0.11 | -1.437 |
| Dummy Variable 3 – Baccalaureate | -0.156 | 0.142 | -0.082 | -1.101 |
| Dummy Variable 4 – Doctoral | -0.65 | 0.211 | -0.294** | -3.08 |
| Student FTE Count | -2.26E-06 | 0 | -0.027 | -0.274 |
| Total IT Campus Budget | 1.88E-09 | 0 | 0.08 | 0.633 |
| Predictor Variables | | | | |
| IT Centralization | -0.872 | 0.8 | -0.157 | -1.091 |
| IT Centralization – Quadratic | -0.065 | 2.194 | -0.004 | -0.03 |
| Budget Transform Operating | 0.016 | 0.01 | 0.163 | 1.719 |
| Budget Transform Operating – Quadratic | -6.45E-05 | 0 | -0.016 | -0.185 |
| Budget Transform Capital | -0.003 | 0.005 | -0.076 | -0.629 |
| Budget Transform Capital – Quadratic | -1.19E-05 | 0 | -0.017 | -0.144 |
| Innovation Focus | 0.383 | 0.07 | 0.464** | 5.446 |
| Innovation Focus – Quadratic | 0.024 | 0.046 | 0.042 | 0.515 |
| Constant | 3.313 | .141 | | 23.513 |

*Note.* Dependent variable: speed of technology adoption.

$R^2 = .296$; $F\ (14, 185) = 6.979$, $p < .001$.

*$p < .05$, ** $p < .01$

Table 12

*Simultaneous multiple regression summary – IT organizational centralization for peer higher education group, student FTE, total campus IT budget, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | 0.002 | 0.03 | 0.003 | 0.064 |
| Dummy Variable 2 – Associates | 0.017 | 0.016 | 0.05 | 1.019 |
| Dummy Variable 3 – Baccalaureate | 0.007 | 0.017 | 0.02 | 0.42 |
| Dummy Variable 4 – Doctoral | -0.142 | 0.022 | -0.356** | -6.472 |
| Student FTE Count | -1.43E-06 | 0 | -0.094 | -1.522 |
| Total IT Campus Budget | -2.08E-09 | 0 | -0.491** | -8.13 |
| Predictor Variables | | | | |
| Budget Transform Operating | -0.001 | 0.001 | -0.041 | -0.667 |
| Budget Transform Operating – Quadratic | 5.35E-07 | 0 | 0.001 | 0.013 |
| Budget Transform Capital | 0.001 | 0.001 | 0.18* | 2.243 |
| Budget Transform Capital – Quadratic | -2.53E-05 | 0 | -0.213** | -2.776 |
| Innovation Focus | 0.004 | 0.008 | 0.028 | 0.511 |
| Innovation Focus – Quadratic | 0.006 | 0.005 | 0.058 | 1.096 |
| Constant | .933 | .014 | | 67.701 |

*Note.* Dependent variable: IT organizational centralization.

$R^2 = .704$; $F\ (12, 188) = 40.725$, $p < .001$.

*$p < .05$, **$p < .01$.

Table 13

*Simultaneous multiple regression summary – adoption of defined governance processes for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | 0.225 | 0.395 | 0.038 | 0.569 |
| Dummy Variable 2 – Associates | 0.108 | 0.218 | 0.04 | 0.494 |
| Dummy Variable 3 – Baccalaureate | -0.159 | 0.217 | -0.057 | -0.732 |
| Dummy Variable 4 – Doctoral | 0.499 | 0.322 | 0.155 | 1.552 |
| Student FTE Count | -1.28E-05 | 0 | -0.104 | -1.019 |
| Total IT Campus Budget | 2.68E-09 | 0 | 0.078 | 0.594 |
| Predictor Variables | | | | |
| IT Centralization | 0.949 | 1.213 | 0.117 | 0.782 |
| IT Centralization – Quadratic | 0.522 | 3.333 | 0.022 | 0.157 |
| Budget Transform Operating | 0.017 | 0.014 | 0.114 | 1.161 |
| Budget Transform Operating – Quadratic | -0.001 | 0.001 | -0.245** | -2.785 |
| Budget Transform Capital | 0.004 | 0.007 | 0.073 | 0.554 |
| Budget Transform Capital – Quadratic | -6.03E-06 | 0 | -0.006 | -0.049 |
| Innovation Focus | 0.446 | 0.107 | 0.371** | 4.171 |
| Innovation Focus – Quadratic | 0.105 | 0.07 | 0.13 | 1.511 |
| Constant | 2.565 | .213 | | 12.023 |

*Note.* Dependent variable: defined governance processes.

$R^2 = .229$; $F\ (14, 186) = 5.245$, $p < .001$.

*$p < .05$, **$p < .01$.

Table 14

*Simultaneous multiple regression summary –adoption of technology standards for peer higher education group, student FTE, total campus IT budget, IT centralization, and leadership focus on innovation*

| Variable | *B* | *SEB* | *β* | *t* |
|---|---|---|---|---|
| Control Variables | | | | |
| Dummy Variable 1 – Other | 0.207 | 0.27 | 0.053 | 0.768 |
| Dummy Variable 2 – Associates | 0.193 | 0.149 | 0.106 | 1.298 |
| Dummy Variable 3 – Baccalaureate | 0.044 | 0.148 | 0.024 | 0.299 |
| Dummy Variable 4 – Doctoral | 0.118 | 0.22 | 0.055 | 0.536 |
| Student FTE Count | 7.98E-06 | 0 | 0.097 | 0.93 |
| Total IT Campus Budget | 3.76E-09 | 0 | 0.163 | 1.217 |
| Predictor Variables | | | | |
| IT Centralization | -1.568 | 0.833 | -0.289 | -1.881 |
| IT Centralization – Quadratic | -3.236 | 2.285 | -0.203 | -1.416 |
| Budget Transform Operating | -0.006 | 0.01 | -0.062 | -0.614 |
| Budget Transform Operating – Quadratic | 6.05E-05 | 0 | 0.015 | 0.167 |
| Budget Transform Capital | 0.014 | 0.005 | 0.361** | 2.788 |
| Budget Transform Capital – Quadratic | 0 | 0 | -0.192 | -1.55 |
| Innovation Focus | 0.105 | 0.073 | 0.13 | 1.432 |
| Innovation Focus – Quadratic | 0.062 | 0.048 | 0.114 | 1.302 |
| Constant | .519 | .147 | | 3.535 |

*Note.* Dependent variable: adoption of technology standards.

$R^2 = .201$; $F\ (14, 185) = 4.579$, $p < .001$.

*$p < .05$, **$p < .01$.

Table 15

*Hypotheses summary table*

| Hypothesis | Description | Result |
|---|---|---|
| H1. | IT organizational centralization within higher education institutions is negatively related to the amount of organizational agility that exists. | |
| | Perception & Processing | Not Accepted |
| | Responding | Not Accepted |
| | Aligning | Not Accepted |
| | Learning | Not Accepted |
| | Competencies | Not Accepted |
| H2. | IT organizational centralization within higher education institutions is negatively related to the speed of technology adoption. | Not Accepted |
| H3. | Leadership focus on innovation within a higher education institution is positively related to the speed of technology adoption. | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| H4. | Leadership focus on innovation within a higher education institution is negatively related to IT organizational centralization within a higher education institution. | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| H5. | Leadership focus on innovation within a higher education institution is positively related to the amount of agility that exists across the organization. | |
| | Perception & Processing | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Responding | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Aligning | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Learning | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Competencies | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| H6. | IT organizational centralization within higher education institutions is positively related with the adoption of defined governance processes and service catalogs. | |
| | Governance Processes | Not Accepted |
| | Service Catalog | Not Accepted |
| H7. | Leadership focus on innovation within a higher education institution is positively related with the adoption of defined governance processes and service catalogs. | |
| | Governance Processes | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Service Catalog | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Accepted |

Table 16

*Research questions summary table*

| Question | Description | Result |
|---|---|---|
| RQ1. | Does IT organizational centralization within higher education institutions have a curvilinear relationship with the amount of organizational agility that exists within the organization? | |
| | Perception & Processing | Not Accepted |
| | Responding | Not Accepted |
| | Aligning | Not Accepted |
| | Learning | Not Accepted |
| | Competencies | Not Accepted |
| RQ2. | Does IT organizational centralization within higher education institutions have a curvilinear relationship with the speed of technology adoption within an organization? | Not Accepted |
| RQ3. | Does leadership focus on innovation within a higher education institution have a curvilinear relationship with the speed of technology adoption? | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| RQ4. | Does leadership focus on innovation within a higher education institution have a curvilinear relationship with IT organizational centralization? | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Accepted |
| RQ5. | Does leadership focus on innovation within a higher education institution have a curvilinear relationship with the amount of organizational agility that exists within the organization? | |
| | Perception & Processing | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Responding | |
| | Organizational Vision & Culture | Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Aligning | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Learning | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Competencies | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |
| RQ6. | Does IT organizational centralization within higher education institutions have a curvilinear relationship with the adoption of defined governance processes and service catalogs? | |
| | Governance Processes | Not Accepted |
| | Service Catalog | Not Accepted |
| RQ7. | Does leadership focus on innovation within a higher education institution have a curvilinear relationship with defined governance processes and service catalogs? | |
| | Governance Processes | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Accepted |
| | Transformative Capital Budget | Not Accepted |
| | Service Catalog | |
| | Organizational Vision & Culture | Not Accepted |
| | Transformative Operating Budget | Not Accepted |
| | Transformative Capital Budget | Not Accepted |

## References


Ahmadi, S. A., Fathizadeh, A., Sadeghi, J., daryabeigi, M., & Taherkhani, L. (2012). A study on the relationship between organizational structure and organizational agility: A case study of insurance firm. *Management Science Letters, 2*(8), 2777-2788.

Alavi, S., Wahab, D. A., Muhamad, N., & Shirani, B. A. (2014). Organic structure and organisational learning as the main antecedents of workforce agility. *International Journal of Production Research, 52*(21), 6273-6295.

Ash, J., & Goslin, L. N. (1997). Factors affecting information technology transfer and innovation diffusion in health care. *Innovation in Technology Management – The Key to Global Leadership. PICMET '07: Portland International Conference on Management and Technology,* 751-754.

Becker, E. (1968). *The structure of evil; An essay on the unification of the science of man.* New York, NY: G. Braziller.

Bititci, U. S. Turner, J., & Ball, P. D. (1999). The viable business structure for managing agility. *International Journal of Agile Management Systems, 1*(3), 190-199.

Boynton, A. C., & Zmud, R. W. (1987). Information technology planning in the 1990's: Directions for practice and research. *MIS Quarterly, 11*(1), 59-71.

Brewer, J. L. & Dittman, K. C. (2010). *Methods of IT project management.* Upper Saddle River, NJ: Prentice Hall.

Breu, K., Hemingway, C. J., Strathern, M., & Bridger, D. (2002). Workforce agility: The new employee strategy for the knowledge economy. *Journal of Information Technology, 17*(1), 21-31.

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research, 16*(1), 64-73.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*(1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.

Dove, R. (1994). The meaning of life and the meaning of agile. *Production, 106*(11), 14-15.

Ebersole, J. (2015, January 6). Higher education issues: 15 for ’15. *Forbes.* Retrieved from http://www.forbes.com/sites/johnebersole/2015/01/06/higher-education-issues-15-for-15/#3bc825b06159

Educause. (2015). Educause core data services (CDS) survey. *Educause.* Retrieved from http://www.educause.edu/research-and-publications/research/core-data-service

Educause. (n.d.a). *About Educause*. Retrieved from http://www.educause.edu/about

Educause. (n.d.b). *Institutional Memberships*. http://www.educause.edu/about/discover-membership/membership-types/institutional-membership

Eisenberg, E. M. (1984). Ambiguity as a strategy in organizational communication. *Communication Monographs, 51*(3), 227-242.

Field, A. (2005). *Discovering statistics using SPSS: (and sex, drugs and rock ‘n’ roll)* (2nd ed.). London: Sage Publications.

Ganguly, A., Nilchiani, R., & Farr, J.V. (2009). Evaluating agility in corporate enterprises. *International Journal of Production Economics, 118*(2), 410-423.

Gartner. (2012, December 12). IT key metrics data 2013: Index of published documents and metrics. *Gartner.* Retrieved from https://www.gartner.com/doc/2274915/it-key-metrics-data-

Glinska, M., Carr, S.D., & Halliday, A. (Feb 2012). Workforce agility: An executive briefing [PDF document]. Retrieved from http://www.darden.virginia.edu/uploadedFiles/Darden_Web/Content/Faculty_Research/Research_Centers_and_Initiatives/Batten_Institute/Research/Publications/BB_WorkforceAgility.pdf

Goduscheit, R. C. (2014). Innovation promoters – A multiple case study. *Industrial Marketing Management, 43*(3), 525-534.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91*(3), 481-510.

Green, K. C. (n.d.) *Kenneth C. Green*. Retrieved from http://www.campuscomputing.net/page/kenneth-c-green-director

Grajek, S. (2016, January 11). Top 10 IT issues, 2016: Divest, reinvest, and differentiate. *Educause.* Retrieved from http://er.educause.edu/articles/2016/1/top-10-it-issues-2016

Gunasekaran, A. (1999). Agile manufacturing: A framework for research and development. *International Journal of Production Economics, 62*(1-2), 87-105.

Hayes, A. F., Glynn, C. J., & Huge, M. E. (2012). Cautions regarding the interpretation of regression coefficients and hypothesis tests in linear models with interactions. *Communication Methods and Measures, 6*(1), 1-11.

Hurley, R. F., & Hult, G. T. (1998). Innovation, market orientation, and organizational learning: An integration and empirical examination. *Journal of Marketing, 62*(3), 42-54.

Javanmardi, M., Khabushani, A., & Abdi, A. (2012). Analysis information technology infrastructures toward supply chain agility in home appliance industry. *Interdisciplinary Journal of Contemporary Research in Business, 4*(3), 416-429.

Jung, S. (2013). Exploratory factor analysis with small sample sizes: A comparison of three approaches. *Behavioral Processes, 97,* 90-95.

Kamhawi, E. M. (2012). Knowledge management fishbone: A standard framework of organizational enablers. *Journal of Knowledge Management, 16*(5), 808-828.

Kanter, R. M. (1983). *The change masters.* New York, NY: Simon & Schuster.

Kastrul, S. (2008). Recruiting the new U.S. IT workforce. *Employment Relations Today, 34*(4), 37-44.

Katsouros, M., Piret, M., Sparrow, J., Theron, V., & Weil, D. (2014). Aligning IT with the institutional mission: Finding the right balance (Run, Grow, Transform). *Educause.* Retrieved from http://www.educause.edu/annual-conference/2014/aligning-it-institutional-mission-finding-right-balance-run-grow-transform

Kontzer, T. (2011). Where to invest your IT dollars in 2012. *CIO Insight, 120*, 28-31.

Lang, L. (2016, March 11). 2015 CDS benchmarking report. *Educause.* Retrieved from https://library.educause.edu/resources/2016/3/2015-cds-benchmarking-report

Leischow, S. J., Best, A., Trochim, W. M., Clark, P. I., Gallagher, R. S., Marcus, S. E., & Matthews, E. (2008). Systems thinking to improve the public's health. *American Journal of Preventive Medicine, 35*(2), 196-203.

Leischow, S. J., Provan, K., Beagles, J., Bonito, J., Ruppel, E., Moor, G., & Saul, J. (2012). Mapping tobacco quitlines in North America: Signaling pathways to improve treatment. *American Journal of Public Health, 102*(11), 2123-2128.

Leischow, S. J., & Milstein, B. (2006). Systems thinking and modeling for public health practice. *American Journal of Public Health, 96*(3), 403-405.

Lewis, L. K., & Seibold, D. R. (1998). Reconceptualizing organizational change implementation as a communication problem: A review of literature and research agenda. *Communication Yearbook, 21*(1), 93-151.

Lichtenstein, M. J., Owen, S. V., Blalock, C. L., Liu, Y., Ramirez, K. A., Pruski, L. A., Marshall, C. E., & Toepperwein, M. A. (2008). Psychometric reevaluation of the scientific attitude inventory-revised (SAI-II). *Journal of Research in Science Teaching, 45*(5), 600-616.

Lin, C., Chiu, H., & Tseng, Y. (2006). Agility evaluation using fuzzy-logic. *International Journal of Production Economics, 101*(2), 353-368.

Lin, L. H. (2011). Electronic human resource management and organizational innovation: The roles of information technology and virtual organizational structure. *The International Journal of Human Resource Management, 22*(2), 235-257.

Lin, L. H., & Lin, W. H., (2010). Innovation and information technology in virtual organizations: An empirical study. *Management of Innovation and Technology (ICMIT), 2010 IEEE International Conference on,* 1188-1193.

Lu, Y., & Ramamurthy, K. (2011). Understanding the link between information technology capability and organizational agility: An empirical examination. *MIS Quarterly, 35*(4), 931-954.

Luhmann, K. (2013). *Introduction to systems theory.* Cambridge, UK: Politely Press.

Marcus, A. A. (1988). Implementing externally induced innovations: A comparison of rule-bound and autonomous approaches. *Academy of Management Journal, 32*(2), 235-256.

Mathiassen, L., & Pries-Heje, J. (2006). Business agility and diffusion of information technology. *European Journal of Information Systems, 15*(2), 116-119.

McCann, J. (2004). Organizational effectiveness: Changing concepts for changing environments. *Human Resource Planning, 27*(1), 42-50.

Moon, S., & Kim, D. (2005). Systems thinking ability for supply chain management. *Supply Chain Management: An International Journal, 10*(5), 394-401.

Morgan, R. E. (2004). Business agility and internal marketing. *European Business Review, 16*(5), 464-472.

Muduli, A. (2013). Workforce agility: A review of literature. *The IUP Journal of Management Research, 12*(3), 55-65.

Murphy, J. A., & Hallinger, P., (1984). Policy analysis at the local level: A framework for expanded investigation. *Educational Evaluation and Policy Analysis, 6*(1)*,* 5-13.

Murray, A. J., & Greenes, K. A. (2006). Workplace innovation: Enterprise of the future. New leadership strategies for the enterprise of the future. *VINE: The journal of Information and Knowledge Management Systems, 36*(4), 358-370.

Ngai, E. W., Chau, D. C., & Chan, T. L. (2011). Information technology, operational, and management competencies for supply chain agility: Findings from case studies. *Journal of Strategic Information Systems, 20*(3), 232-249.

Orton, J. D., & Weick, K. E., (1990). Loosely coupled systems: A reconceptualization. *Academy of Management Review, 15*(2), 203-223.

Overby, E., Bharadwaj, A., & Sambamurthy, V. (2006). Enterprise agility and the enabling role of information technology. *European Journal of Information Systems, 15*(2), 120-131.

Pedhazur, E. J. (1997). *Multiple regression in behavioral research: Explanation and Prediction* (3rd ed.). Fort Worth, TX: Harcourt Brace College Publishers.

Peppard, J. (2016). Rethinking the concept of the IS organization. *Information Systems Journal, 2016*. http://dx.doi.org/10.1111/isj.12122

Porodzinsky, A. (2014, October 17). Refocus the IT budget on growth. *Information Week Network Computing.* Retrieved from http://www.networkcomputing.com/applications/refocus-it-budget-growth/1448198801

Probert, S. K. (2014). Book review: Introduction to Systems Theory. *International Journal of Systems and Society, 1*(1), 55-57.

Reed, M. (1986). *Redirections in organizational analysis.* London: Tavistock.

Reinard, J. C. (2008). *Introduction to communication research* (4th ed.). New York, NY: McGraw-Hill.

Richards, C.W. (1996). Agile manufacturing: Beyond lean? *Production and Inventory Management Journal,* 37(2), 60-64.

Ribgy, C., Day, M., Forrester, P., & Burnett, J. (2000). Agile supply: rethinking systems thinking, systems practice. *International Journal of Agile Management Systems, 2*(3), 178-186.

Rockart, J. F., Earl, M. J., & Ross, J. W. (1996). Eight imperatives for the new IT organization. *Sloan Management Review, 38*(1), 43-55.

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Conceptualizing the role of information technology in contemporary firms. *MIS Quarterly, 27*(2), 237-263.

Sambamurthy, V., & Zmud, R. (2000). The organizing logic for an enterprise's IT activities in the digital era – A prognosis of practice and a call for research. *Information Systems Research, 11*(2), 105-114.

Scott, W. R. (2006). *Organizing on the edge: Appreciation and critique.* Paper presented at 2006 Command and Control Research and Technology Symposium.

Seo, D., & La Paz, A. I. (2008). Exploring the dark side of IS in achieving organizational agility. *Communications of the ACM, 51*(11), 136-139.

Sharifi, H., & Zhang, Z. (1999). A methodology for achieving agility in manufacturing organisations: an introduction. *International Journal of Production Economics, 62*(1-2), 7-22.

Stangarone, J. (2014, October 21). 5 big challenges facing CIOs and IT leaders in 2015 (part 1). [Web log comment]. Retrieved from http://www.mrc-productivity.com/blog/2014/10/5-big-challenges-facing-cios-and-it-leaders-in-2015-part-1/

Stevens, J. P. (1992). *Applied multivariate statistics for the social sciences* (2nd ed.) Hillsdale, NJ: Erlbaum.

Straub, D., Boudreau, M., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems, 131*(24), 380-427.

Streiner, D. L. (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment, 80*(1), 99-103.

Stokols, D., Hall, K. L., Taylor, B. K., & Moser, R. P. (2008). The science of team science: Overview of the field and introduction to the supplement. *American Journal of Preventive Medicine, 35*(2), 77-89.

Subhankar, D. (2012). From outsourcing to cloud computing: Evolution of IT Services. *Management Research Review, 35*(8), 664-675.

Swanson, E. B., & Ramiller, N. C. (2004). Innovating mindfully with information technology. *MIS Quarterly, 28*(4), 553-583.

Sweeny, L. B., & Sterman, J. D., (2000). Bathtub dynamics: Initial results of a systems thinking inventory. *System Dynamics Review, 16*(4), 249-286.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston: Allyn & Bacon.

Thao, T. P. (2012). *Enterprise systems and organizational agility: Developing and exploring a causal model* (Doctoral dissertation). Retrieved from http://researchbank.rmit.edu.au/eserv/rmit:160275/Trinh.pdf

Thompson, P., & McHugh, D. (2003). *Work organisations: A critical introduction.* New York, NY: Palgrave Macmillan.

Tiwana, A., & Konsynski, B. (2010). Complementarities between organizational IT architecture and governance structure. *Information Systems Research, 21*(2), 288-304.

Tseng, Y., & Lin, C. (2011). Enhancing enterprise agility by developing agile drivers, capabilities and providers. *Information Sciences, 181*(17), 3693-3708.

Vaes, K. (2013, June 13). IT budget: Run, grow & transform. Retrieved from https://kvaes.wordpress.com/2013/06/13/it-budget-run-grow-transform/

Vakola, M. (2014). What's in there for me? Individual readiness to change and the perceived impact of organizational change. *Leadership & Organization Development Journal, 35*(3), 195-209.

Vinodh, S., Devadasan, S.R., Reddy, V., & Ravichand, K. (2010). Agility index measurement using multi-grade fuzzy approach integrated in a 20 criteria agile model. *International Journal of Production Research, 48*(23), 7159-7176.

Wade, M., & Buechel, B. (2013). Anchored agility: The holy grail of competitiveness. *Perspectives for Managers, 186*, 1-4.

Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly, 21*(1), 1-19.

Winer, B. J., Brown, D. R., & Michels, K. M. (1991). *Statistical principles in experimental design* (3rd ed.). New York, NY: McGraw-Hill.

Worley, C. G., & Lawler, E. E. (2010). Agility and organization design: A diagnostic framework. *Organizational Dynamics, 39*(2), 194-204.

Yusuf, Y., Sarhadi, M., & Gunasekaran, A. (1999). Agile manufacturing: The drivers, concepts and attributes. *International Journal of Production Economics, 62*(1-2), 33-43.

Zain, M., Rose, R. C., Abdullah, I., & Masrom, M. (2005). The relationship between information technology acceptance and organizational agility in Malaysia. *Information & Management, 42*(6), 829-839.

# Appendix A: Educause Collaboration Agreement

EDUCAUSE

Thomas E. Bunton, bunton@uwm.edu
Director of Network & Operations Services
University of Wisconsin-Milwaukee
PO Box 413
Milwaukee, WI 53201-0413
UNITED STATES
(414) 229-7374

Leah Lang, llang@educause.edu
Director of Analytics Services
EDUCAUSE
1150 18th Street, NW, Suite 900
Washington, DC 20036

February 9, 2017

Dear Thomas,

It is our understanding that you would like to access EDUCAUSE Core Data Service data to further your research on organizational agility within higher education IT organizations. EDUCAUSE is happy to provide you with an extract of identifiable CDS data in .csv format. This form of information sharing falls under the following sections in the EDUCAUSE Analytics Services License Agreement and Appropriate Use Policy (please read more about the AUP at https://analytics.educause.edu/auth-saml/assets/pdf/EAS%20AUP.pdf):

- *EDUCAUSE, its staff, and relevant service providers will access Institutional Data using individually unique credentials that they must not share.*
- *EDUCAUSE, its staff, and relevant service providers will limit disclosure and use of Institutional Data obtained from EDUCAUSE Analytics Services to EDUCAUSE staff and consultants with formal responsibilities related to the use of such Institutional Data. This limitation applies to both institutionally identifiable and aggregated data. This limitation does not apply to any derivative work that EDUCAUSE may create from the Institutional Data, any of which can be licensed or sub-licensed to third parties.*
- *EDUCAUSE, its staff, and relevant service providers will store Institutional Data and provide access to it, as appropriate, in a secure manner.*
- *EDUCAUSE reserves the right to use aggregated survey data obtained from EDUCAUSE Analytics Services in professional publications, public documents, public presentations, or other forms or forums that serve its members' needs and interests, so long as that data has been sufficiently aggregated to prevent re-identification of participating institutions.*

EDUCAUSE

As part of this data sharing engagement, EDUCAUSE would like to establish the following conditions:

- Both EDUCAUSE and you, Thomas, are bound by the general provisions of the AUP. As such, you agree to use CDS data in accordance with the EDUCAUSE Analytics Services License Agreement and Appropriate Use Policy.
- You, Thomas, will share results of your research with EDUCAUSE.

Please indicate your agreement to the proposed terms by signing below. We look forward to reviewing the results of your work!

Sincerely,

Signatures Removed
from Electronic Version

Signatures Removed
from Electronic Version

_____ _____

Leah Lang

EDUCAUSE

Thomas Bunton

University of Wisconsin-Milwaukee

# Appendix B: UW – Milwaukee IRB Approval



## Determination of UWM IRB Submission

**INSTRUCTIONS**: Not all research involving humans will require UWM IRB submission or approval. Only activities meeting the regulatory definitions of **(a)** "**research**" and **(b)** "**human subjects**" and where **(c)** UWM is "**engaged**" in the conduct of human subjects research require UWM IRB review and approval.

This form may be used as **(1)** a tool to help you determine whether you may need to file a New Study Submission to the UWM IRB, and/or **(2)** documentation of formal notice that the UWM IRB is not "engaged" in "human subjects research" requiring UWM IRB review/approval.

### SECTION 1: DETERMINATION OF "RESEARCH"

**Research** – "a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge."

| RESEARCH | NOT RESEARCH |
|---|---|
| Activities 'designed to develop or contribute to generalizable knowledge' are those activities designed to draw general conclusions (i.e., knowledge gained from a study may be applied to populations beyond the specific study population), inform policy, or generalize findings.<br><br>The project may be "research" If it:<br>• intends to advance general knowledge in the academic, scientific, or professional community;<br>• is conducted using a research design that will lead to scientifically valid findings;<br>• and the subjects are not expected to benefit personally from the knowledge gained.<br>• is completed to obtain a Master's degree or PhD. | Projects may be systematic but not "research." Some examples of not "research" include:<br><br>• classroom projects solely to fulfill course requirements and the intention is to not share the results beyond the University community;<br>• QI/QA, EBP or program evaluation activities designed to improve the quality or performance of a department or program where it is not the intention to share the results beyond the local community. ***See QI/Eval questions below;<br>• Most of the subjects who participate in the project are expected to benefit from the knowledge gained and the main goal of the project is to improve services;<br>• Oral history activities, in general, are designed to create a record of specific historical events and, as such, are not intended to contribute to generalizable knowledge. Only those oral history projects that conform to that regulatory definition of research need to submit their research protocols for IRB review. |

***Use the information above to answer the following questions.***

1. Do the proposed activities involve a systematic approach? A "systematic" approach involves a predetermined method or a plan for studying a specific topic, answering a specific question, testing a specific hypothesis, or developing theory. A systematic approach incorporates collection of data, either quantitative or qualitative, or specimens; and analysis.

   **[_X_] YES** **[__] NO**

   **If NO,** please explain why the proposed activities do not involve a systematic approach:
   <Type Here>

2. Is the intent of the proposed activities to *develop or contribute to generalizable (scholarly) knowledge****?

   **[_X_] YES** **[__] NO**

**If NO,** please explain the intent of proposed activities and explain how the proposed activities are not intended to contribute to generalizable knowledge:
<Type Here>

***If you think your project may be considered *a Quality Improvement / Evidence-Based Practice project or Program Evaluation ONLY and WILL NOT contribute to generalizable knowledge* please confirm by answering either the QI/EBP or Evaluation questions below. Either ALL QI/EBP or ALL Evaluation questions must be YES to be considered a Quality Improvement / Evidence-Based Practice Project or a Program Evaluation.
**In addition, a letter from the institution where the project will be conducted must be attached to this form. This letter should state their determination that the project is QI, EBP, or a Program evaluation, and they will approve you to conduct the research at their institution.**

| ***Quality Improvement/ Evidence-Based Practice*** | ***Program Evaluation*** |
|---|---|
| **QI1**. The project is being initiated/conducted based on the request and needs of a department, institution, or organization for internal purposes only.<br>[__] YES [__] NO | **E1.** The evaluation is being initiated based on the request and needs of a partner organization or department for internal purposes only.<br>[__] YES [__] NO |
| **QI2**. The study is NOT designed to expand knowledge of a scientific discipline or scholarly field of study.<br>[__] YES [__] NO | **E2.** The intent of the evaluation is to improve a specific program and/or to meet funder requirements.<br>[__] YES [__] NO |
| **QI3**. All activities are "routine care," "standard practice," or "evidence based" and conducted by staff where the project will take place. Untested methods and/or interventions are NOT being evaluated.<br>[__] YES [__] NO | **E3.** The program being evaluated is evidence based (already shown to be effective). Untested services, programs and/or interventions are NOT being evaluated.<br>[__] YES [__] NO |
| **QI4**. The project does NOT involve a control group or randomization or blinded interventions.<br>[__] YES [__] NO | **E4.** The evaluation does NOT involve randomization of participants, but may involve comparison of variations in programs.<br>[__] YES [__] NO |
| **QI5.** The project is NOT externally funded.<br>[__] YES [__] NO | |
| **QI6.** NO drugs, biologics and/or devices without FDA approval are being used in the project or being used for a non-FDA approved purpose.<br>[__] YES [__] NO | |

**If YES to 1 & 2 these activities constitute research. Go to Section 2.**

**If NO to any of the QI/EBP or Program Evaluation Questions, these activities constitute research. Go to Section 2.**

**Otherwise, the criteria for research are not met. Go to Section 4.**

## SECTION 2: DETERMINATION OF "HUMAN SUBJECT"

*Human subject* - a *living individual* about whom an investigator (whether faculty, student, or staff) conducting research obtains: (1) data through *intervention or interaction* with the individual or (2) *identifiable private information*.

*(1) Intervention* includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes.

*(1) Interaction* includes communication or interpersonal contact between researcher and subject.

*(2) Identifiable* includes when it is possible that the identity of the subject is or may be ascertained by the researcher or associated with the information

*(2) Private information* includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical or educational record information). Private information must be *individually identifiable* through use of identifiers (name, dob, SSN) or through use of a code.

***Use the definitions above to answer the following questions.***

1. Are the human subjects *living individuals*? This also applies to charts reviews and datasets.

   [ ] **YES** [X] **NO**

   **If NO to 1, the criteria for human subjects are not met. Go to Section 4.**

2. Do the activities involve UWM personnel obtaining information through *intervention* or *interaction* about the individuals (i.e., prospective collection of data/specimens; online interactions or surveys; etc.)?

   NOTE: If you are asking only questions about a program, product, or policy (and no questions specifically about the individual), this answer should be "NO."

   [ ] **YES** [ ] **NO**

   **If YES to 1 & 2, the activities involve human subjects. Go to Section 3.**

3. Do the activities involve UWM personnel accessing *individually identifiable* (e.g., names, medical record numbers, social security numbers, study ID codes, etc.) **and** *private* information about living individuals? This applies to charts, records, datasets, and specimens. **Even if you are not recording identifiers, if the source of the data contains identifiers, then mark this question as a "yes."

   [ ] **YES** [ ] **NO**

   **If YES to 1 & 3, the activities involve human subjects. Go to Section 3.**

4. Do the activities involve UWM personnel obtaining or receiving *individually identifiable* (e.g., names, medical record numbers, social security numbers, study ID codes, etc.) **and** *private* information about living individuals? This applies to charts, records, datasets, and specimens.
***If you are receiving a coded dataset, and a key exists somewhere to link the data to the original participant, even if you do not have access to the key, mark this question "Yes".

[ ] **YES** [ ] **NO**

**If Yes to 1 & NO to 4 the criteria for human subject are not met. Go to Section 4.**

4a. **If yes to #4**, will your dataset contain direct identifiers such as name, date of birth, social security number or medical record number?

[ ] **YES** [ ] **NO**

**If YES to 1 & 4 & YES to 4a, the activities involve human subjects. Go to Section 3.**

4b. **If yes to #4 and No to #4a,** you appear to be using coded data. Is there:

- a written agreement that prohibits the UWM researcher and his/her research team from having access to the key linking the study ID number to personal identifiers, OR
- are there legal requirements or written policies in place restricting release of the key until the participant is deceased, OR
- is it extremely unlikely that the UWM researcher will ever be able to access the key?

[ ] **YES** [ ] **NO**

**If YES to 1 & 4, NO to 4a and NO to 4b, the activities involve human subjects. Go to Section 3.**

**If YES to 1 & 4, NO to 4a and YES to 4b, the activities DO NOT involve human subjects. Please explain your response to 4b below and then go to Section 4.**

## SECTION 3: DETERMINATION OF "ENGAGED"

**Engaged**: An institution is considered to be engaged in research if certain federal criteria are met and may be subject to IRB review/approval.

**UWM Auspices:** UWM personnel (student, faculty, or staff) who: (1) act on behalf of the institution; (2) exercise institutional authority or responsibility; or (3) perform institutionally designated activities.

**Non-UWM researchers** wishing to conduct human subjects research using UWM personnel as subjects or its

facilities are not considered to be engaged. This document is for the determination of UWM IRB review only and you are expected to obtain other permission as necessary. For example, the UWM IRB does not have authority to grant the release or use of UWM listservs, equipment, or facilities.

| ENGAGED | NOT ENGAGED |
|---|---|
| UWM is considered to be engaged in human subjects research if UWM or UWM personnel are involved in **any** the following activities under UWM auspices:<br>• direct awardee of a federal grant, award, or contract;<br>• obtaining informed consent;<br>• performing invasive or noninvasive procedures with subjects;<br>• intervening for research purposes with any subjects by manipulating the environment;<br>• interacting for research purposes with any subject; (e.g., conducting research interviews or administering questionnaires); or<br>• obtaining private identifiable information. | UWM is considered to not be engaged in human subjects research if UWM or UWM personnel are **solely** involved in the following activities:<br>• performing commercial/service where: (a) the services performed do not merit professional recognition or publication privileges; (b) the services performed are typically performed by those institutions for non-research purposes; and (c) the institution's employees or agents do not administer any study intervention being tested or evaluated under the protocol;<br>• inform (e.g., provide a copy of informed consent document, information about contacting the investigator, seek or obtain the prospective subjects' permission for investigators to contact them) prospective subjects about the availability of the research but do not obtain subjects' consent for the research or act as representatives of the investigators; or<br>• releasing identifiable private information/specimens pertaining to the subjects of the research. |

***Use the information above to answer the following question.***

1. Is UWM engaged in human subjects research?

   **[__] YES [__] NO***

   ***If YES or NO,** please explain why UWM **IS** or is **NOT** engaged in human subjects research:
   <Type Here>

2. Is any non-UWM IRB involved in reviewing this project?

   **[__] YES* [__] NO**

   ***If YES,** please explain which IRB(s) and the status of IRB approval(s):
   <Type Here>

**If YES to 1, UWM is engaged. Go to Section 4** **Otherwise, UWM is not engaged Go to Sec.4.**

## SECTION 4: IS YOUR PROTOCOL HUMAN SUBJECTS RESEARCH, AND UWM IS ENGAGED?

If based on your responses in Section 1 the activities constitute research; **and** per your responses in Section 2 the activities involves human subjects; **and** per your responses in Section 3 UWM is engaged then IRB review and approval of your study is required before study activities can begin. Please complete and submit the appropriate documents for a New Study Submission and submit them through IRBManager. All forms are available on the IRB website under the Forms and Templates section. If you have questions, contact the IRB office at irbinfo@uwm.edu.

If your responses indicate that UWM is **not engaged** in **human subjects research**, you are **not required** to submit an IRB application. If you would like confirmation and documentation from the IRB staff that your proposed activities do not constitute UWM being engaged in human subjects research, or if you are uncertain if your study meets the definition of human subjects research, please complete this form including Sections 5 - 6 below and submit the MS Word document to irbinfo@uwm.edu. You will receive a response from the IRB staff within 2-3 working days.

## SECTION 5: STUDY INFORMATION

1. Describe the purpose of the proposed activities. State the overall objectives and specific aims. Provide a brief description of the procedures.
   The goal of the study is to evaluate Agility within Higher Education IT organizations. For example, does organizational decentralization lead to increased agility.

2. Describe the subject population, or the type of data and/or specimens to be studied.
   The subject population will be Higher Education Institutions.

3. Describe how the data and/or specimens will be obtained.
   Data will be obtained via a formal request to Educause requesting permission to use and access various survey component response that are of interest. The data will come from the Educause 2015 Core Data Services annual survey, which collects institutional data (organizational size, structures, budgets, etc.) from numbers of Higher Education Institutions.

## SECTION 6: PROJECT TITLE AND RESEARCHER

| | | | |
|---|---|---|---|
| **Project Title:** | Agility within Higher Education IT Organizations: A Loosely Coupled Systems Perspective | | |
| **Name:** | PI: Dr. Erin Ruppel<br>Student PI: Thomas E. Bunton | **Department/ Institution:** | Department of Communication<br>University of Wisconsin - Milwaukee |
| **Telephone:** | 414-229-5539<br>765-414-5148 | **Email:** | ruppele@uwm.edu<br>bunton@uwm.edu |

## UWM IRB DETERMINATION OF UWM ENGAGEMENT IN HUMAN SUBJECTS RESEARCH

**Researchers** do not complete this section. **For IRB staff only**

[ X ] The activities as described **DO NOT** constitute UWM being engaged in Human Subjects Research. Submission of an IRB Application to UWM is not required.

[ ] The activities as described **DO** constitute UWM being engaged in Human Subjects Research. Submission of a UWM IRB Application **IS REQUIRED**. IRB Approval must be obtained before the research can begin.

| | |
|---|---|
| Leah Stoiber<br>IRB Staff | 1/27/2017<br>Date |

## Appendix C: Educause Survey Components

**Control Variables**

1. Peer Higher Education Group - Carnegie 2010 Classification (carnegie2010)
    a. Associate (Assoc/PrivNFP, Assoc/Pub-R-L, Assoc/Pub-R-M, Assoc/Pub-R-S, Assoc/Pub-S-MC, Assoc/Pub-S-SC, Assoc/Pub-U-MC, Assoc/Pub-U-SC, Assoc/Pub2in4, Assoc/Pub4)
    b. Baccalaureate (BAC/A-S, Bac/Assoc, Bac/Diverse)
    c. Master (Masters-L, Masters-M, Masters-S)
    d. Doctoral (DRU, RU/H, RU/VH)
    e. Other (Spec/Arts, Spec/Bus, Spec/Eng, Spec/Faith, Spec/Health, Spec/Med, SYS, Tribal)
2. Number of Full-Time Equivalent Students (Student_FTE_2013)
3. Total Campus IT Expenditures
    a. Total central IT expenditures (m1q18_total_2015)
    b. IT expenditures outside central IT (m1q30_1_2015)

**IT Centralization on Campus**

1. Proportion of Full Time IT staff
   Total Central FTE (m1q28_staff_total_2015)
   IT Staff FTE outside central IT (m1q30_2_2015)
2. Proportion of Budget
   Total Central Expenditures (m1q18_total_2015)
   IT Expenditures outside central IT (m1q30_1_2015)

**Speed of Technology Adoption**

What was your institution's preferred approach to adopting technology? (m1q10_2015) – 5 item Likert Scale

- We were one of the last to adopt new technologies
- We tended to adopt new technologies after our peers did
- We tended to adopt new technologies at the pace of our peers
- We strived to be early adopters of new technologies where we saw exceptional benefits
- We were usually among the very first to adopt new technologies

**Standards**

1. Our IT governance process creates a campus-wide view of technology standards and services (m1q13_4_6_2015)
    - Absent / ad hoc, Repeatable, Defined, Managed, Optimized
2. Did central IT maintain any service portfolio(s) or service catalog(s)? (m1q7_2015)
    - No / Yes, includes distributed IT / Yes, does not include distributed IT

**Leadership Focus on Innovation**

1. Financial
    1. Operational
       Percentage of expenditures - Transform (m1q22_trans_operating_text_2015)
    2. Capital
       Percentage of expenditures – Transform (m1q22_trans_capital_text_2015)
2. Leadership Focus and Communication
    1. The organization has developed, communicated and invested in clear support strategies. Explicit learning budgets exist and innovation time is built into schedules. (m1q11_5_4_2015)
    2. Senior leaders recognize the importance of a growth mindset, and regularly take public risks in pursuit of bold outcomes. This willingness to take risks is recognized and celebrated. (m1q11_5_1_2015)
    3. The organization has established agreed-upon processes to promote, support, and reward innovation, which are communicated clearly and consistently. (m1q11_4_2_2015)
    4. Vision: A focus on innovation drives the vision of the organization which is explicitly linked to students' needs. Participants at all levels can articulate the vision. (m1q11_1_1_2015)
    5. Purpose: Innovation efforts have a clear, shared sense of purpose. Strategies are developed, documented and implemented with the learning benefit being shared across the organization. (m1q11_1_2_2015)
    6. Permission: Innovation is explicitly encouraged, celebrated and studied across the organization. All members of the organization feel empowered to design and try new approaches. (m1q11_1_3_2015)
    7. Routine: Teams expect to innovate continually and have a developed clear, shared routines for doing so, which are continually iterated upon and improved, as needed. (m1q11_1_4_2015)
    8. Urgency: Leaders not only explicitly prioritize innovation, but they establish clear expectations and timelines as the basis for making organizational progress. (m1q11_1_5_2015)
    9. Trade-offs: Innovation is frequently prioritized in decision-making because it is a strong organizational value. Trade-offs that make innovation possible are transparent and explicitly shared (m1q11_1_6_2015)
    10. Champion: Leaders at multiple levels of the organization champion and are held accountable for creating environments that promote innovation, risk-taking and new approaches. (m1q11_2_3_2015)
    11. Team: The organization consistently invests in its capacity to innovate and broadly communicates this value. Leaders are held accountable to develop their teams' capacity to innovate. (m1q11_3_1_2015)

**Proposed CDS Survey Components Arranged in Seo and LaPaz (2008) Agility Framework**

Three Different 5 Items Likert Scales in Use

1. Entering, Emerging, Adapting, Establishing, Transforming
2. Absent / ad hoc, Repeatable, Defined, Managed, Optimized
3. Strongly disagree / Disagree / Neutral / Agree / Strongly agree

**Perception:** Sensing, the ability to receive either strong or weak signals from internal or external sources

1. Our data are of the right quality/are clean. (m8q7_1_1_2015)
2. We have the right kinds of data. (m8q7_1_2_2015)
3. Our data are standardized to support comparisons across areas within the institution. (m8q7_1_3_2015)
4. Our data are standardized to support comparisons across institutions. (m8q7_1_4_2015)

**Processing:** Ability to create knowledge out of the data in order to make informed decisions

1. Our data are collected for a purpose. (m8q7_1_6_2015)
2. Reports are in the right format and show the right data to inform decisions. (m8q7_1_8_2015)
3. We have the right tools/software for analytics. (m8q7_1_10_2015)
4. We have sufficient capacity to store, manage, and analyze increasingly large volumes of data. (m8q7_2_4_2015)
5. Our data are "siloed"; we have pockets of individuals who protect their data (Inversed) (m8q7_2_5_2015)

**Responding:** Ability to quick and appropriately act on knowledge

1. We have business professionals who know how to apply analytics to their areas. (m8q7_4_3_2015)
2. Our analysts know how to present processes and findings to stakeholders and to the broader institutional community in a way that is visually intuitive and understandable. (m8q7_4_4_2015)
3. We have a process from moving from what the data say to making changes / decisions. (m8q7_6_5_2015)
4. We have demonstrated with at least one high-profile "win" that analytics can lead to improved decision-making, planning, or outcomes. (m8q7_6_6_2015)
5. Light Structures: Informal structures continue to emerge and inform ongoing changes to formal organizational structures, which are designed, implemented and communicated consistently. (m1q11_4_1_2015)

**Aligning:** Ability to re-evaluate and re-align existing processes and resources to adopt new business processes

1. Our institution has a clear IT vision, mission, or strategy. (m1q13_2_1_2015)
2. Our IT governance process influences and enables IT strategic direction. (m1q13_2_2_2015)
3. Our IT governance process sets high-level goals for IT outcomes that are aligned with institutional strategy goals. (m1q13_2_3_2015)

4. Orientation: Policy enables innovation. Incentive structures are aligned and leaders develop new vehicles to advance the role of innovation in transforming student outcomes. (m1q11_6_1_2015)
5. Our IT governance process prioritizes IT investment in accordance with institutional goals. (m1q13_3_1_2015)
6. Use of data is part of our strategic plan. (m8q7_6_4_2015)

**Learning:** Ability to build on experiences and resources to adopt new business processes

1. Testable Hypothesis: All experiments are time-bound, testable, and designed to yield actionable data not only on the project at hand, but on the overall institutional strategy for innovation. (m1q11_7_1_2015)
2. Transparency: The organization not only explicitly values transparency around lessons learned, but it has systems in place to regularly communicate lessons learned. (m1q11_2_5_2015)
3. Frequency: Lessons are regularly shared across all leaders and stakeholder groups. There are specific strategies or mechanisms in place to promote regular sharing. (m1q11_2_6_2015)

**Competencies:** Knowledge about the market and the processes between internal and external processes that support agile processes

1. We have IT professionals who know how to support analytics. (m8q7_2_6_2015)
2. Funding for analytics is viewed as an investment, rather than an expense. (m8q7_3_2_2015)
3. We invest in analytics training. (m8q7_3_4_2015)
4. We have a sufficient number of professionals who know how to support analytics. (m8q7_4_1_2015)
5. Our senior leaders are publicly committed to the use of analytics and data-driven decision making. (m8q7_5_1_2015)
6. We have a culture that accepts the use of data to make decisions. (m8q7_5_3_2015)

## Appendix D: Emergent Factor Structure

**Perception:** Sensing, the ability to receive either strong or weak signals from internal or external sources and **Processing:** Ability to create knowledge out of the data in order to make informed decisions.

The measure of reliability (α = .827)

1. Our data are of the right quality/are clean. (m8q7_1_1_2015)
2. We have the right kinds of data. (m8q7_1_2_2015)
3. Our data are standardized to support comparisons across areas within the institution. (m8q7_1_3_2015)
4. Our data are standardized to support comparisons across institutions. (m8q7_1_4_2015)
5. Our data are collected for a purpose. (m8q7_1_6_2015)
6. Reports are in the right format and show the right data to inform decisions. (m8q7_1_8_2015)
7. Our data are "siloed"; we have pockets of individuals who protect their data. (m8q7_2_5_2015)

**Responding:** Ability to quick and appropriately act on knowledge

The measure of reliability (α = .823)

1. We have a process from moving from what the data say to making changes / decisions. (m8q7_6_5_2015)
2. Use of data is part of our strategic plan. (m8q7_6_4_2015)
3. Our senior leaders are publically committed to the use of analytics and data-driven decision making. (m8q7_5_1_2015)
4. We have a culture that accepts the use of data to make decisions. (m8q7_5_3_2015)

**Aligning:** Ability to re-evaluate and re-align existing processes and resources to adopt new business processes

The measure of reliability (α = .920)

1. Our institution has a clear IT vision, mission, or strategy. (m1q13_2_1_2015)
2. Our IT governance process influences and enables IT strategic direction. (m1q13_2_2_2015)
3. Our IT governance process sets high-level goals for IT outcomes that are aligned with institutional strategy goals. (m1q13_2_3_2015)
4. Our IT governance process prioritizes IT investment in accordance with institutional goals. (m1q13_3_1_2015)

**Learning:** Ability to build on experiences and resources to adopt new business processes

The measure of reliability (α = .901)

1. Testable Hypothesis: All experiments are time-bound, testable, and designed to yield actionable data not only on the project at hand, but on the overall institutional strategy for innovation. (m1q11_7_1_2015)

2. Transparency: The organization not only explicitly values transparency around lessons learned, but it has systems in place to regularly communicate lessons learned. (m1q11_2_5_2015)
3. Frequency: Lessons are regularly shared across all leaders and stakeholder groups. There are specific strategies or mechanisms in place to promote regular sharing. (m1q11_2_6_2015)
4. Orientation: Policy enables innovation. Incentive structures are aligned and leaders develop new vehicles to advance the role of innovation in transforming student outcomes. (m1q11_6_1_2015)
5. Light Structures: Informal structures continue to emerge and inform ongoing changes to formal organizational structures, which are designed, implemented and communicated consistently. (m1q11_4_1_2015)

**Competencies:** Knowledge about the market and the processes between internal and external processes that support agile processes

The measure of reliability ($\alpha = .850$)

1. We have IT professionals who know how to support analytics. (m8q7_2_6_2015)
2. Funding for analytics is viewed as an investment, rather than an expense. (m8q7_3_2_2015)
3. We invest in analytics training. (m8q7_3_4_2015)
4. We have a sufficient number of professionals who know how to support analytics. (m8q7_4_1_2015)
5. We have the right tools/software for analytics. (m8q7_1_10_2015)
6. We have sufficient capacity to store, manage, and analyze increasingly large volumes of data. (m8q7_2_4_2015)
7. We have business professionals who know how to apply analytics to their areas. (m8q7_4_3_2015)
8. Our analysts know how to present processes and findings to stakeholders and to the broader institutional community in a way that is visually intuitive and understandable. (m8q7_4_4_2015)
9. We have demonstrated with at least one high-profile "win" that analytics can lead to improved decision-making, planning, or outcomes. (m8q7_6_6_2015)

# Curriculum Vitae

Thomas E. Bunton
Graduate School, University of Wisconsin – Milwaukee

## EDUCATION

**Ph.D.** Organizational Communication
Dissertation: Agility within higher education IT organizations: A loosely coupled systems perspective
University of Wisconsin – Milwaukee — Milwaukee, WI

**Master of Science** Computer & Information Technology
Thesis: Motivating the Millennial Generation of IT Employees
Purdue University — West Lafayette, IN

**Bachelor's Degree** Double Major in Pre-Law and Psychology
Minor: Computer Information Systems and Technology
Purdue University — West Lafayette, IN

## RELATED EXPERIENCE

**Director of Technology Infrastructure & Operations**
University of Arkansas at Little Rock — Little Rock, AR
*(March 2016 – Current)*

- Member of the University's IT Executive Leadership Team providing direction, strategy, and IT oversight to enable and empower the enterprise to optimally achieve its mission
- Responsible for the implementation and operation of all technology infrastructure deployed within the UALR enterprise, including data centers, network and server services, telephony, service monitoring, workstation management, visualization, cloud strategy, unified communication, storage and related software
- Provide overall leadership and technical direction to ensure the technology environment is secure, durable, available, performs optimally, and extensible to meet UALR's strategic academic, research, and administrative needs
- Responsible for the overall strategy, planning, and deployment of services from Internet technologies to data centers through personal desktop systems, aligning enterprise investments and identifying value opportunities in their delivery
- Provide direction and leadership to a team of associate directors, system architects, high performance computing and research instrument administrators, network engineers, system, endpoint, and application administrators, and access management professionals

**Director of Network & Operations Services**
University of Wisconsin, Milwaukee — Milwaukee, WI
*(September 2013 – March 2016)*

- Member of the University's IT Cabinet providing direction, strategy, and IT business alignment to effectively support, prioritize, and manage campus needs with efficient and effective IT solutions
- Responsible for managing an IT portfolio approaching $9 million annually within University Information Technology Services (UITS), the central IT division, providing campus facilities, technologies and core infrastructure for recruitment, teaching, learning, and research
- Provide leadership and oversight of the Network and Operations Services departments, which is responsible for implementing, supporting, and maintaining campus IT infrastructure including data networking and telecommunications, numerous WAN connections, data centers and operations, system and storage administration, authentication services, and core application services
- Responsible for the campus-wide transition of Office 365 from procurement through technical implementation, transitioning 60,000 user accounts to the cloud based infrastructure in 5 months
- Transitioned campus to a single vendor network environment, tripling the capability of refreshing network hardware in campus buildings and ultimately funding a campus wide VPN service
- Managed the campus wide wireless initiative, responsible for securing funding, resources, contractors, and technology for the $4.5 million campus deployment
- Drafted and executed the vision for shared services to better align employee skills with scalable workloads while reducing the duplication of effort and competing financial interests
- Provide direction and leadership to a team of assistant directors, managers, network engineers, installers, system and application administrators, and access management professionals

**Director, Application Administration**
Information Technology at Purdue — West Lafayette, IN
*(November 2012 – September 2013)*

- One of four directors responsible for the reorganization of 10 distinct business unit IT groups within the Administrative Computing Organization
- Provide vision, strategy, and operational oversight for Information Technology activities within and across university business areas, reducing duplication while leveraging core IT services
- Responsible for directing the purchased application portfolio of 175 systems and applications including Point of Sale, Housing, Talent Management, Health Systems, and Student Conduct
- Directs the enhancement, maintenance, and production support activities for business systems and oversees the integration of the IT services within the campus ITIL framework

- Facilitated workshops on process development for portfolio management, effort reporting, and organizational and business success metrics
- Developed a comprehensive telecommunications plan, including engaging consulting firms to assist in drafting the future state of technology within university's auxiliary business units
- Accountable for the selection and evaluation of wired and wireless technologies within University Residences, including the recent pilot evaluation of two distinct approaches to implementation with a projected project savings of $4 million dollars
- Provided direction and leadership to a team of managers, application administrators, data integrators, and reporting analysts

**Associate Director, Information Technology (Housing and Food Services)**
Purdue University Administrative Computing — West Lafayette, IN
*(February 2009 – November 2012)*

- Chaired the department's Information Technology Strategic Workgroup, tasked with identifying and leveraging information technology to create competitive advantages within all business units
- Facilitated the department's Information Technology Strategic Plan
- Developed and enforced divisional IT policies to enhance IT security and minimize risks
- Guided technology procurement, vendor negotiations, and strategic partnerships
- Introduced and chaired the Emerging Technology Grant whereby employees at all levels can recommend and pilot new technologies to streamline operations and improve satisfaction
- Developed the information technology portfolio to manage and track total IT service costs providing insight and resources for departmental decision making including buy/build analyses
- Restructured departmental desktop support services, providing a higher quality service while achieving a $150,000 yearly savings (over 50% reduction)
- Led the university's initiative to expand upon existing collaborative IT services to better align staff expertise, reduce duplication, and leverage purchasing power
- Provided direction and leadership to a team of managers, application and system administrators, developers, workstation support staff, and student employees

**Director, Call Center Operations (Campus Wide IT Service Desk)**
Information Technology at Purdue — West Lafayette, IN
*(May 2005 – February 2009)*

- Developed and implemented the vision to transition the central IT help desk averaging 75,000 contacts yearly into a high performing Service Desk with a 1st tier resolution time of 30 minutes

- Lead the campus's ITIL service support initiative (incident and problem management) partnering with over 400 central IT staff members delivering 110 IT services Drafted and implemented policies involving user support, service desk ownership, outage reporting, target response/resolution times, and technical and hierarchical escalations
- Developed the support methodology for the campus ERP deployment (SAP & Banner)
- Implemented an IT Service Support lifecycle including the introduction, ongoing management, and retirement of IT services and corresponding support and communication structures
- Initiated a first tier forecasting model to overcome a $120,000 budget deficit

**Manager of Data Network Services**
Information Technology at Purdue — West Lafayette, IN
*(July 2002 – May 2005)*

- Responsible for the creation and operations of the Data Network Services Help Desk supporting the residential and wireless networks averaging 50,000 contacts yearly
- Managed the deployment and maintenance of the residential network, including a $3.5 million upgrade in summer 2004 introducing Cisco equipment into the Residential Network
- Provided strategic planning for emerging network technologies along with long term capacity planning including caching services, network switches, and limiting hardware
- Administered departmental servers and led application development team creating interfaces with existing university systems and developing web based applications to interface equipment
- Responsible for policy development and approval, overall network security, including appropriate departmental server and system administration, and application development best practices

**Network Engineer**
Purdue University Computing Center — West Lafayette, IN
*(May 2000 – June 2002)*

- Chief engineer responsible for installing, configuring, and troubleshooting 800+ network devices
- Lead a team for summer network installations/upgrades
- System administrator for production and development servers that monitored network status and usage, authenticated remote ADSL users, tracked employee time, and provided end-users web and email access to support and network status information

## PROFESSIONAL ACTIVITIES

**Chair – Campus Endpoint Management Committee**
University of Arkansas at Little Rock (Spring 2016 to Current)

**Participant – Integrated Shared Services Organization Change Management Team**
University of Wisconsin – Milwaukee (Fall 2015 to Winter 2016)

**Chair – Shared IT Infrastructure Initiative**
University of Wisconsin – Milwaukee (Spring 2014 to Summer 2015)

**Presidential Faculty Fellow Appointment**
Purdue University (Fall 2002 – Fall 2013)

**Host Committee – 2013 Student Technology Conference**
Purdue University (June 2013 Conference)

**Chair – HFS Emerging Technology Grant**
Housing and Food Services (July 2011 – September 2013)

**Tutor – College of Technology**
Purdue University (August 2011 – December 2011)

**Chair – Information Technology Strategic Workgroup**
Housing and Food Services (February 2009 – May 2010)

**Chair – Committee for Institutional Cooperation – IT Customer Support**
Champaign, IL (Spring 2008 – Spring 2009)

**Establishing a Service Desk According to ITIL Best Practices Practitioner's Certification**
Las Vegas, NV (February 2006)

**Foundation in IT Service Management Certificate**
Purdue University (October 2005)

## NATIONAL AND INTERNATIONAL CONFERENCE PRESENTATIONS

***Experience with Technology for Career Exploration***
Fetherston, M., Cherney, M., & Bunton, T (2015).
*Central States Communication Association Annual Conference* – Grand Rapids, Michigan

***What IT Leaders Need to Know about Motivating the Youngest Generation of IT Employees***
Bunton, T.E. (2012).
*Educause Online Annual Conference* – Denver, Colorado

***Discovering Workplace Motivators for the Millennial Generation of IT Employees***
Bunton, T.E., & Brewer, J.L. (2012).
*Association for Computing Machinery's Special Interest Group for Information Technology Education – Research in Information Technology (ACM SIGITE RIIT)*
Mount Royal University – Calgary, Alberta, Canada

***Application of McClelland's Theory of Needs to IT Project Management and the Millennial***
Bunton, T.E., & Dittman, K.C. (2012).
*Clute Institute International Academic Conference*

***Communicating to the Masses: Implementing a Campus-wide Digital Signage Solution***
Bunton, T.E., & Wright, J.D. (2011).
*Student Technology Conference* – Yale University

***What Do They Want? Tapping the Student Perspective***
Childs, D., Gray, G., & Bunton, T.E. (2003).
*ResNet Conference* – Ferris State University

***Bridging the Gap Between the Call Center and the Subscriber***
Bunton, T.E. (2003).
*ResNet Conference* – Ferris State University

***Prohibition of the 21st Century: Policies for Student Use of Internet Resources***
Bunton, T.E. (2003).
*Michigan Collegiate Telecommunications Associations (MiCTA)*

**BOOK REVIEW**
***The Handbook of Technology Management – January 2010***
Bidgoli, Hossein. Editor-in-Chief

**PUBLICATIONS**
**Uncertainty, Technology Use, and Career Preparation Self-Efficacy**
Fetherston, M., Cherney, M., & Bunton, T.
*Western Journal of Communication* (in press).

**Student Predisposition to Instructor Feedback and Perceptions of Teaching Presence Predict Motivation Toward Online Courses.**
Cole, A. W., Anderson, C., Bunton, T. E., Cherney, M. R., Cronin Fisher, V., Draeger Jr., R., Fetherston, M., Motel, L., Nicolini, K. M., Peck, B., & Allen, M.
*Online Learning* (in press).

**Digital Signage Goes Viral on Campus**
*Signage Solutions*, *3(2)*

**Purdue University's Digital Signage Enterprise**
*HigherEdTechDecisions* (EH Publishing)

**Digital Signage Lessons Learned**
*HigherEdTechDecisions* (EH Publishing)

**3 Digital Signage Tips from Purdue University**
*HigherEdTechDecisions* (EH Publishing)

**Purdue Implements New Policy for Online Use**
*DMCA Alert Volume, 1*(6)

**Tremendous Amounts of Bandwidth Get Used for this Activity**
*DMCA Alert Volume, 1*(4)