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IT Centralization and the Innovation Value Chain in Higher Education: A Study for Promoting Key Innovations Through Innovation Management and Organizational Design

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IT Centralization and the Innovation Value Chain in Higher Education: A Study for Promoting Key Innovations Through Innovation Management and Organizational Design

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Abstract

The purpose of the present study was to investigate the impact of organizational centralization in higher education technology support units on institutional innovativeness. The centralization tools used for the present study included measures developed by Hage & Aiken (1971), Kaluzny, et al. (1974), and Ferrell & Skinner (1988). The innovativeness measures were established by Hansen & Birkinshaw's (2007) tool for evaluating innovation value chain activities in organizations. Data were gathered from a nation-wide sample (n = 303) of IT workers at 38 research one institutions in the United States. The results indicated that innovation value chain activities (idea generation, conversion, and diffusion) were negatively impacted as centralization increased. However, these findings varied significantly by the type of institution being measured, the phase of the innovation value chain being studied, and the type of reporting line for each participant.

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"Our chief want is someone who will inspire us to be what we know we could be" (Ralph Waldo Emerson). Thanks finally to my wife, Dona Clark, for always inspiring me to find and become the best version of me.

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Chapter I

Introduction

Background of the Problem

The importance of innovation management for higher education organizations has never been more critical. A variety of factors have combined to present new challenges for American universities, particularly public universities. These challenges consist of a sea of demographic changes, combined with a corresponding change in student needs and desires (Snyder & Dillow, 2015; Desrochers, et al., 2010). There is a trend of decreasing funding from states for public education that has persisted since 1980 (Mortenson, 2012). These funding changes have been accompanied with accountability demands for increased efficiency and greater student outcomes, from graduation rates to employment at graduation (Huisman & Currie 2004; King, 2007; McLendon, Hearn, & Deaton, 2006). The entries of new private and for-profit institutions have created an intense level of competition for students around the globe (Hemsley-Brown & Oplatka, 2006; Dill, 2003). Finally, rapid changes in technology have afforded new opportunities, but many institutions have struggled to keep pace (Boezerooij 2006; Kassens-Noor, 2012; Al-Qahtani & Higgins, 2013; Merchant, et al. 2014).

Many scholars have studied these factors—from accountability to demographics and technological progress—and measured their impacts on higher education. However, as researchers probe these trends, new gaps in the literature have emerged. For example, have accountability demands and funding shortfalls made universities more or less innovative? Some universities have decided to

decentralize academic units into self-sustaining spin-offs, while others have decided to centralize control as much as possible. Have cuts in student and faculty support impacted the ability of schools to adapt swiftly to emerging challenges? Which models work best to preserve the ability to generate, adopt, and diffuse new ideas?

The issues presented by these questions are compounded when national demographic changes are also taken into account. The blend of white and non-white students has changed drastically over the past 20 years, with an increasingly high percentage of incoming students representing "at-risk" populations (Gavigan, 2010; Klemencic & Fried, 2015). These students suffer from a greater rate of attrition than traditional students, and require increased attention and interventions in order for them to succeed (Jones & Watson, 1990). While the term "at-risk" broadly encompasses a large population that includes first-generation students, students from lower socio-economic backgrounds, immigrant students, and students of color, there is evidence that a great many strategies must be employed and tailored to promote retention in each of these segments (Dumbrigue, Moxley, & Durack, 2013).

Furthermore, incoming students have different needs and wants in regard to technology than they have in past generations. These students have been collaborating electronically since a very young age, using cloud-based services provided by Google and Microsoft. They have turned in assignments online since the 3rd grade, and accessed their grades and assignments via the web. The average child has had a cellphone since age 10 and more than half of these children use a smartphone to access social media and interact with their peers (Boerma, 2014).

Accompanying this change in students is a dynamic rate of change in the technologies available to consumers. Bandwidth availability and usage has quadrupled in 10 years. The last decade has seen the rapid conversion of DVDs to Blu-Ray discs to purely streaming media. Cable and satellite providers confront a new generation of customers that have no interest in their offerings, other than the bandwidth that they can provide to access online sites and services (Steel & Marsh, 2015). High definition video has more than quadrupled in resolution and virtual reality is poised to become a new standard for interacting with digital media (Sydell, 2016; Kuusisto, 2015).

As new technologies have emerged, so have new players in the higher education space. For-profit, fully online universities like the University of Phoenix and Capella made huge splashes initially, but currently face stiff challenges in the form of poor student outcomes, high debt, and a critical federal government stance (Lam, 2015). However, other players like EdX and Coursera have partnered with large, prestigious universities like Stanford and MIT to deliver instruction in new formats like MOOCs (massively open online courses), self-paced modules, and adaptive learning approaches. While these offerings add prestige and serve as valuable marketing tools for the most elite institutions, the vast majority of schools have not been participants in these new partnerships (Hampson, 2012).

Institutional responses to these challenges have been varied and consist of a wide range of approaches, successes, and failures. Responses to budget reductions have included centralization efforts and spin-offs of professional schools. Data analytics and learner analytics have been made possible by new software platforms

and have been adopted by most institutions to meet the needs of changing student demographics. These tools have been used to improve recruitment efforts as well as the retention of existing students at each college (Creasey, 2008). Many schools have launched online courses and programs to match the convenience offered by for-profit online institutions. Most have adopted some amount of blended or technology-enhanced learning approaches, which utilize technological affordances to provide better learning experiences. Finally, a growing number of institutions have established instructional innovation centers to support faculty in adopting new approaches to teaching and learning, from online courses to flipped classrooms, where lectures are pre-recorded and presented online while class time is used for in-depth discussions (Graham, Woodfield, & Harrison, 2012). However, despite these attempts to innovate, many colleges have failed to survive this combination of critical stresses. A Moody's prediction forecasts that the closure of small colleges and universities will triple to 15 per year by 2017 (Woodhouse, 2015).

Problem Statement

A large body of evidence has demonstrated the critical importance of innovation to organizations (Borins, 1998, 2001; Andrews et al., 2006; Christensen et al., 2004; Damanpour et al., 2009; Tidd et al., 2001). Furthermore, scholars have also identified many problems involved in successfully implementing these innovations (Ensminger, 2005; Griffith, Zammuto, & Aiman-Smith, 1999; Meyer & Goes, 1988; Surry & Ely, 2002; Polley, et al., 1999), including the cultural and resource barriers to implementation within organizations (Aubert & Hamel 2001; Denis, et al., 2002; Heide, et al., 2002; Fennell & Warnecke 1988; Rogers 2003).

However, there is very little research that provides guidance on how organizational structures can influence the likelihood of implementation of key technological innovations (Damanpour & Wischnevsky 2006; Tidd, 2001). While Damanpour's (1996) research mapped the broad impact of centralization on innovativeness in large and small firms, Damanpour and Wischnevsky's (2006) paper suggests that units within an organization can also have large impacts on the innovation cycle:

> "Future research on the generation of innovation should compare and contrast independent entrepreneurial organizations with the autonomous units of established, large organizations engaged in the generation of innovation—not with those organizations in their entirety" (p.279).

Given that institutions of higher education are organized differently, and that technology support organizations inside each institution are also organized differently, there is a need to further understand how these structural differences may impact innovation generation and diffusion rates. Current literature on innovation has focused on many factors that may promote adoption and diffusion in organizations. However, very little research has been done in understanding the impact of these new challenges in public higher education on organizational innovativeness, specifically: accountability, funding changes, demographic changes, increasing competition, and rapid technology changes. Furthermore, scarce research has been conducted in measuring the value of common institutional responses and their positive (or negative) impacts on organizational innovativeness. Moreover, literature on centralization has generally underestimated (or not considered) the role of subunits within a given organization, and has not typically

included higher education as an area of study. It is important to isolate aspects of centralization that can be controlled by higher education institutions and that also have larger impacts on the innovation process. Finally, the innovation value chain, which describes innovation as a process progressing from idea generation to conversion to diffusion, is likely to be greatly impacted by the level of centralization of technology subunits within higher education institutions. This connection has not been explored in previous research.

Purpose of the Research

The purpose of this research is to measure the impact of centralization in public higher education technology support units on their respective institutions' abilities to generate, convert, and diffuse new innovations. Understanding what organizational approaches would enhance each phase of the innovation process could increase the capabilities of deeply stressed institutions to survive in a rapidly changing environment.

Hypotheses

Hypothesis 1. This study hypothesizes that more decentralized technology structures will show greater effectiveness during the idea generation phase than more centralized structures.

Hypothesis 2. This study hypothesizes that more decentralized technology units will show greater effectiveness during the idea conversion phase than more centralized structures.

Hypothesis 3. This study hypothesizes that more centralized technology structures will show greater effectiveness during the diffusion phase than more decentralized structures.

Hypothesis 4. This study hypothesizes that more centralized technology structures will show lower effectiveness for all three phases of the innovation value chain than more decentralized structures.

Hypothesis 5. This study hypothesizes that participation in decision making measures will show more significant correlations with innovation value chain phases than hierarchy of authority measures.

Significance of the Research

This study will illuminate the strengths and weaknesses of specific and controllable aspects of centralization for faculty, staff, and administrators hoping to utilize new technologies to achieve their respective institutional goals. The results from this study will help colleges and universities to choose and design organizational structures and processes to help promote key innovations, while providing them with a broader understanding of the strengths and weaknesses of their current organizational models. Specific audiences that will benefit most from this research include presidents and administrators at R1 institutions.

Delimitations

This study will only include data from research one (R1) institutions in the United States, which may not be generalizable to schools that fall into other categories (e.g., private, Master's comprehensive, etc.).

Definition of Key Terms

Centralization. For the purposes of this study, this term is defined as a measure of both 1) participation in decision making and 2) hierarchy of authority in a given organization.

Innovation. For the purposes of this study, this term is defined as "an idea, practice, or object that is perceived as new by an individual or unit," which "presents a new alternative or alternatives, as well as a new means of solving problems" (Rogers, 2003).

Innovation Value Chain. For the purposes of this study, this term is defined as a view of innovation as "a sequential, three-phase process that involves idea generation, idea development, and the diffusion of developed concepts" (Hansen & Birkinshaw, 2007).

Chapter II

Literature Review

Public higher education institutions face a variety of intensifying pressures, from state accountability regimes and changing student demographics to new competitors and potentially disruptive technology-based approaches. These pressures have required universities to consider new ways of doing business in order to remain competitive. As these pressures mount, different institutions have opted to centralize or decentralize operations while attempting to increase their organizational innovativeness. Under these conditions, it is reasonable to assume that public higher education institutions would desire to understand the potential impacts of their centralization and decentralization decisions on their abilities to manage the innovation process.

This study will focus specifically on technology service unit centralization in public higher education (as measured by centralization survey tools created by Hage & Aiken (1971), Kaluzny, et al. (1974), and Ferrell & Skinner (1988)) and the relationship of this relative centralization to innovation management practices within these institutions as determined by Hansen & Birkinshaw's (2007) Innovation Value Chain (IVC) tool. Consequently, this review of the literature will focus on three primary areas of interest: 1) accountability, funding, demographic, and competitive pressures in public higher education that have led to calls for rapid changes, 2) centralization and tools for understanding levels of centralization, the importance of subunits in organizations, and the linkage of subunits with impacts in technology adoption models, and 3) studies that highlight the current

understanding of factors that lead to innovation generation, conversion, and diffusion; along with an analysis of the innovation value chain framework. This chapter will then conclude with a rationale for the present study.

Pressures on Public Higher Education and Institutional Responses

Accountability. U.S. public higher education institutions are under increasing pressure from their respective state governments to justify their funding (Spellings, 2006). In fact, approximately 50% of the United States had implemented accountability programs for public higher education institutions by 2013 (Dougherty, et al., 2013). State accountability regimes generally are composed of two categories of demands: 1) calls for increased efficiency, and 2) calls for better student outcomes. In the first category, legislative accountability measures often include demands for decreased administrative costs and increased operational efficiency (Leveille, 2006). One result of these demands is a trend toward centralization of operations and support units at many institutions (Geiger, 2015). Some institutions, like the University of Minnesota, have been publicly shamed for their administrative bloat (Belkin & Thurm, 2012). In response, the University of Minnesota promised to centralize operations and cut millions in administrative costs. Similarly, other large institutions, from Arizona State University to the University of Texas at Austin, have focused on reducing administrative costs and related positions (Lindsay, 2015).

The second category of accountability demands call for better student outcomes, including retention, graduation, and employment rates (Huisman & Currie 2004; King, 2007; McLendon, Hearn, & Deaton, 2006). The 2016 report,

"Amplifying Human Potential: Education and Skills for the Fourth Industrial Revolution", commissioned by Infosys corporation, found that former college students around the globe are questioning whether their educations adequately prepared them for their careers (Infosys, 2016). The pressure comes not only from student consumers and state legislators, but also from national bodies, including the U.S. Department of Education (DOE). In 2006, the DOE's Report "A Test of Leadership: Charting the Future of U.S. Higher Education" called for increased accountability, access, and affordability in higher education (Spellings, 2006). Creasey (2008) writes about the trend:

> Recently higher education administrators have been held accountable to provide (a) measurements, (b) process, and (c) policy. Moreover, administrators are expected to respond to chancellors, provosts, boards, and committees to (a) justify expenditures, (b) engage in strategic planning, (c) manage their organizations, and (d) understand the value of IT investments. (p. 1)

This heightened oversight of universities and colleges extends from ensuring the alignment of business processes with IT investments, to "demonstrating the impact of technology on student learning outcomes" (Creasey, 2008, p. 1). These pressures, both from new generations of students and faculty, as well as from state and national organizations, call for increased integration of technological innovations at institutions of higher education.

Demographic Changes and Increased Competition. National demographics have also been a factor in the calls for change. The US Department of

Education recently found that the percentage of students of color in American colleges has risen dramatically from 1976 to 2011, while the percentage of white students has declined from 84% to 61% (Snyder & Dillow, 2015; Desrochers, et al., 2010).

Many of these growing populations fall under the category of at-risk students, which require new and improved approaches to their education (Gavigan, 2010). Klemencic and Fried (2015) describe a declining domestic population of 18-24 year olds in the United States along with a rapidly increasing aging population. Siemens and Matheos (2012) write of the implications of a population explosion in Asia and a focus on skills-based education in an ever expanding technological environment. Klemencic and Fried conclude:

> Competition for…students among higher education institutions will become stronger, creating incentives for the recruitment of foreign students and for supplementing the traditional students with lifelong learners. Thus, higher education institutions will have to adjust their academic programs and organizational structures and become more permeable, de-emphasizing their social selectivity and accommodating the needs of an increasingly diverse student population. (p. 13)

Intense competition is another factor that is forcing universities to innovate and adopt new business models. Hemsley-Brown and Oplatka (2006) describe the intensifying awareness of universities for their need to compete thusly: "In the context of increasing competition for home-based and overseas students higher educational institutions now recognize that they need to market themselves in a

climate of international competition" (p. 316). Similarly, Dill (2003) posits that "US higher education is the most market-oriented system in the world" (p. 137). This market-oriented competitiveness is driven by large and growing numbers of private and for-profit institutions competing for the same pool of students, along with federal programs that fund individual students and researchers. Furthermore, Hoxby (1997) concludes that increasing competitiveness is partially due to the erosion of geographic monopolies in public higher education over time (i.e., that students used to attend in-state public schools at a much higher rate than they do today).

It is therefore critical that institutions consciously engage in the practice of innovation management, so that new opportunities to advance student and faculty success are leveraged appropriately and more quickly.

Funding Pressures. Adding to this pressure from accountability demands and demographic changes is a persistent decline in all but two states (Wyoming and North Dakota) in state funding for public universities since the early 1980s (Mortenson, 2012). A Moody's (Moody's, 2013) financial outlook report concluded:

> For 2013, Moody's revises its outlook for the entire US higher education sector to negative, marking a shift to negative from stable for even the sector's market leading diversified colleges and universities. The outlook for the remaining majority of the sector remains negative, as it has been since 2009. The new sector-wide negative outlook reflects mounting pressure on all key university revenue sources, requiring bolder actions by university leaders to reduce costs and increase operating efficiency. (p. 1)

Technological Advances. Finally, many scholars (Boezerooij 2006; Kassens-Noor, 2012; Al-Qahtani & Higgins, 2013; Merchant, et al. 2014) have pointed out the global and distance-ameliorating effects of e-learning, social media, and virtual reality offerings, which have fundamentally changed the nature and potential of educational delivery via technological means. A recent report on technology and education (Infosys, 2016) found that rapid technological change was promoting an emerging emphasis on skills-based learning, particularly in technology-related skills. The report, consisting of surveys of thousands of 16-25 year olds from countries with the nine largest global economies, discovered that "young people agree overwhelmingly that technology has positively influenced their development" (p. 28). A large majority of these survey participants agreed that technology had enabled new ways to access educational resources and offerings.

All of these factors add to the pressure on public higher education institutions to become more innovative.

Institutional Responses. Institutions of higher education, both public and private, have raised tuition significantly over the past 25 years, even when adjusted for inflation (Ehrenberg, 2012; Baum & Ma, 2012; Archibald & Feldman, 2012). Desrochers, et al, (2012) attribute these tuition increases at public institutions to declines in state funding, particularly after the 2001 recession. Tuition has been the most stable source of revenue for these institutions, considering all sources of funding, from federal grants to donor gifts. Desrochers, et al. (2012) found that as increasing costs have become less subsidized by states, tuition has risen accordingly.

Institutions have also turned to new ways to deliver their courses to wider audiences. These range from common locally-delivered online courses to Massive Open Online Courses (MOOCs) delivered through partnerships with large non-profit organizations, like EdX and Coursera. Typically, these latter offerings involve higher profile institutions like MIT, Harvard, and Berkeley, and are considered a measure of institutional prestige. Voss (2013) states: "The participating colleges and universities have stated that they believe their involvement with these initial efforts will extend, enhance, and preserve their institutional reach, brand, and reputation" (p. 2).

Meanwhile, lesser profile institutions have been expanding their online offerings in order to attract new students and offer more convenience for their local students (Rosenberg, 2001; Bates, 2005). A large number of scholars (Giannoni, et al., 2003; Covington, et al., 2005; Maguire, 2005) have highlighted the problem of faculty resistance to online teaching modalities. Yet Allen & Seaman (2007) found that the demand from students for online courses has grown very rapidly and that most university leaders expect this trend to continue. Furthermore, this trend has also emerged in corporate environments, where employees are expected to engage in online learning as part of their required trainings and professional development activities. (Yoon, 2003; Smart & Cappel, 2006). This tension between student, workforce, and faculty expectations highlights the importance of innovation and change management in higher education.

One of the most common demands of accountability regimes for public higher education is for increased efficiency and decreased administrative costs

(Desrochers, 2010). However, the combination of funding cuts and accountability measures that call for increased administrative efficiency and centralization may be working against the demands for institutions to innovate in order to promote student success for a rapidly changing college student profile (Currie Huisman 2004, p.1). Paradoxically, these pressures have resulted in conflicting institutional responses. Zusman (2005) found that schools could either respond by centralizing or decentralizing operations under these conditions. For example, some institutions have asked their professional schools to become self-supporting autonomous units, which would equate to decentralization of these programs. On the other hand, when faculty positions are retrenched the remaining faculty have less input in governance and curriculum decisions (Slaughter & Rhoades 2004). Some researchers have proposed the arrival of a "centralized decentralization" model in higher education (Watkins, 1996; Boezerooij 2006), where staff and services are developed and paid for by local departments and colleges while under the broad control of institutional policies and objectives. In the midst of so many conflicting priorities, some institutions have decided to try to buck against their state accountability regimes by accepting less in appropriations in return for more local autonomy and control.

Many of the attainable improvements available to these colleges and universities will require new and judicious implementations of technological innovations, whether these relate to advancements in data analytics, improved communication systems, or enhanced classroom technologies (Creasey, 2008). Under these conditions, it is reasonable to assume that public higher education

institutions would desire to understand the potential impacts of their centralization and decentralization decisions on their abilities to manage the innovation process.

Innovation Concepts

Research in innovation is very rich and constantly expanding. This is in large part due to the assertion of many scholars that innovation is the most important factor in the success of organizations (Crossan & Apaydin, 2010; Kemp, et al., 2003; Rosenbusch, et al., 2011). Crossan & Apaydin (2010) found the number of research articles concerning innovation has risen exponentially in recent years, while lamenting the absence of unifying definitions, variables, and frameworks for the field.

Even defining the word "innovation" has become a contentious issue in its own right. From Shumpeter's (citation) definition in (1942) ("industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one" (p. 73), to the United States Secretary of Commerce's lengthy definition in 2008 ("the design, invention, development and/or implementation of new or altered products, services, processes, systems, organizational structures, or business models for the purpose of creating new value for customers and financial returns for the firm" (p. *v*.), there is a plethora of proposed meanings in between.

However, the most cited publication on innovation is Rogers' (2003) work, *Diffusion of Innovations*, a study of how new innovations are disseminated through societies. Rogers defines innovation as "an idea, practice, or object that is perceived

as new by an individual or unit," one which "presents a new alternative or alternatives, as well as a new means of solving problems" (p. 12). Diffusion is defined as "the process in which an innovation is communicated through certain channels over time among members of a social system" (p. 5). This definition establishes a process, or sequence, in promoting the utility and usage of new innovations, both for individuals and for organizations. Indeed, Rogers says that this innovation decision is a "process that occurs over time and consists of a series of different actions" (p. 169).

In his work, Rogers defines 5 stages for this innovation communication process for individuals, along with enablers (and inhibitors) of each stage. These stages begin with knowledge, progressing to persuasion, and subsequently decision, implementation, and confirmation. Rogers also specifies a series of "prior conditions" which help predict success for the innovation process. These include previous practices, the felt needs and problems of the individual, the innovativeness of the individual, and the norms of her/his social systems. This seminal work led to a large number of subsequent studies which analyzed each phase, from knowledge to confirmation. The five stages are next discussed in turn:

The **knowledge** stage is preceded by a prior condition of need. Until an individual has identified a need for improvement, s/he may practice "selective awareness" (Rogers, p. 171) and not recognize the value of available innovations and their applications to their situation. The knowledge stage consists of three types of awareness. First, an individual must be aware of the existence of a particular innovation; second, the individual must possess the knowledge to use the

innovation; and third, the individual must understand the basic principles for using the innovation so that it can be used most effectively. A variety of scholars have focused on the individual and organizational characteristics that might help promote success in the knowledge phase. While Baldrige and Burnham (1975) found no significant correlations with individual characteristics, later researchers (Glynn, 1996; Stoker, et al., 2001) found that attributes like familiarity with the work setting, creativity, self-efficacy, and lesser need for work direction resulted in greater initial innovation behaviors. Others, like George, et al. (2006), have used Hall and Hord's (1987) Concerns Based Adoption Model to identify individual feelings about particular innovations, which led to greater adoption and greater implementation as individuals became more interested in using the innovations.

Some other scholars have also investigated the organizational factors that may enhance success in the knowledge stage. Abrahamson & Rosenkopf (1997) and Fritsch and Monz (2010) found that the quality of the social network is key to advancing knowledge sharing within an organization. Fitzgerald, et al., (2002) concluded that strong organizational silos were a detriment to Rogers' innovation-decision process.

The second stage, **persuasion**, concerns the attributes of innovations that make them more or less attractive than the currently employed alternatives. These characteristics include relative advantage, which encompasses both price and effectiveness; compatibility, both with individual and organizational needs and norms; relative complexity, where ease of use helps accelerate the innovation-decision process; and reinvention, where users can reuse the innovation in new

ways than it was originally intended. All of these characteristics lead the individual to form a "favorable or unfavorable attitude toward the innovation" (Rogers, p. 174). Kleinschmidt and Cooper (1995) established the strong significance of these attributes in the innovation-adoption decision, and reviews of the literature (Tornatzky & Klein, 1982; Van der Panne, et al., 2003, Jeyaraj, et al., 2006) have confirmed this positive correlation. The more that these positive traits are exhibited, the more likely that the individual will choose to adopt the innovation.

The third stage, **adoption** (or rejection), is the decision point for the individual, who chooses whether to use or abandon the innovation. Rogers (2003) found that the decision to adopt was made easier if the innovation could be used on a trial basis. This attribute of trialability, where the innovation is tried out in low stakes environments, has been investigated by Lin & Chen (2012), Jeyeraj, et al., (2006), and Ducharme, et al., (2007), who found medium strength correlations amidst some mixed results. In the adoption stage, the Technology Acceptance Model (TAM), developed by Davis (1989) and expanded by Venkatesh (2000), has become the most often used tool to predict individual adoption (Jeyeraj, et al., 2006).

Venkatesh, et al. (2003) subsequently created the Unified Theory of Acceptance and Use of Technology (UTAUT), which attempts to bring together all research findings of individual adoption into a unified theory. The variables identified in UTAUT include: performance expectancy, effort expectancy, attitude toward using technology, social influence, facilitating conditions, self-efficacy, and individual anxiety. These variables reflect the latest thinking on the most important

variables in individual adoption, and introduce some organization-related concepts which will be discussed later in this section.

The fourth stage, **implementation**, is described as the point "when an individual or other decision-making unit puts an innovation to use" (Rogers, p. 179). Importantly, this is the stage where innovations are "re-invented" to match the unique needs of individuals within their particular environments (Rogers, p. 180). Klein and Knight (2005) and Holahan, et al. (2004) are among a wide range of scholars that have studied implementation in topics ranging from computers in manufacturing firms to science courses in public schools. Klein & Knight (2005) found that implementation is affected by 6 main factors: 1) the existence of policies an organization has created to address implementation, 2) organizational climate, 3) management support for the innovation, 4) available financial resources to support the implementation, 5) the learning orientation of the organization, and 6) long-term orientation (or "management patience" (p. 245)). Many of these variables again point to environmental variables within an organization, and will be discussed shortly.

The final stage of Rogers theory of diffusion of innovations is **confirmation**, in which individuals look for external feedback on the innovation and seek "reinforcement for the innovation-decision already made, and may reverse this decision if exposed to conflicting messages about the innovation" (Rogers, p.189). Here, the goal is to avoid dissonance, as the individual has already built up a body of knowledge about a particular innovation, analyzed its relative advantages, and has implemented it. Negative feedback has a powerful affect at this point on the

individual's desire to continue using the innovation, which may lead to discontinuation of implementation.

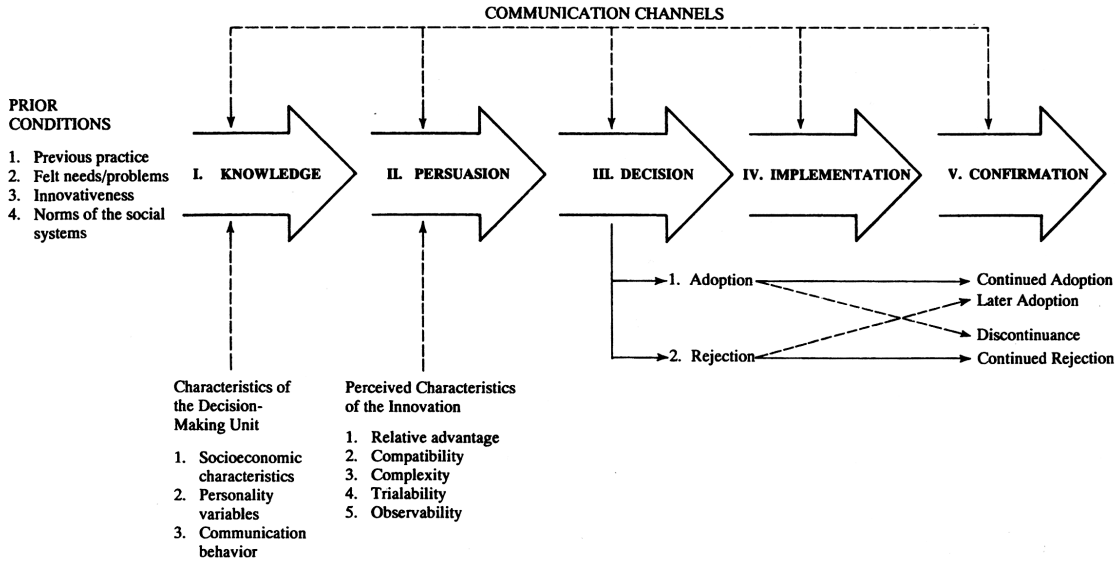

Figure 1. A Model of Five Stages of the Innovation-Decision Process. Rogers (2003), page 170. Reprinted under Fair Use guidelines.

Importantly, Rogers differentiates the stages of innovation within organizations from that of individuals. These organizational stages start with an initiation phase, comprising agenda-setting and matching; and an implementation phase, composed of redefining/restructuring, clarifying, and routinizing.

Agenda-setting is the process of clarifying an organizational vision and a problem that must be addressed for the firm to be successful. This closely matches the pre-existing need condition in the individual innovation-decision model. **Matching** is the process of selecting innovations that will best address the identified problem(s) in the agenda-setting stage. Once these two stages have completed, the adoption decision has been made, and the organization moves to the implementation phase.

During the implementation phase, an organization goes through the process of **redefining/restructuring**, which consists of re-inventing the innovation so that it can work with the organization, while also adapting the organization to accommodate the new invention. According to Van De Ven (1986), "innovations transform the structure and practices of [their organizational] environments" (p. 605). Organizational adaptation could include the creation of new organizational units, like a skunkworks, or a restructuring of the current organization.

Next, the organization will enter the **clarifying** stage, in which the organization grows to understand the meaning and potential scope and scale of change that will be associated with the innovation. Rogers warns that implementing an innovation too rapidly at this stage can "lead to disastrous results" (p. 427). If the innovation feels forced quickly by the organization on individuals, rejection is more likely to occur. This concept relates to the importance of a participative environment (Stoker 2001; Fitzgerald, et al., 2002), which allows individuals to feel less directed and more self-efficacious.

The final step in the organizational implementation phase is **routinization**, where the innovation "has become incorporated into the regular activities of the organization and has lost its separate identity" (Rogers, p. 428-429). At this point, the subject in question is no longer viewed as innovative and the organization will either start with new agenda-setting or discover new matches for its identified problems.

Rogers posits that interest in innovation in organizations has increased greatly because of the introduction of new computer-related technologies. He notes

that “the implementation of many of these new technological…innovations has failed” (p. 418) and concludes that organizational innovation has become a critical area of focus for managers.

Ferlie & Shortell (2001) focus on organizational pre-existing factors that help advance innovations in organizations, including organizational culture and climate. They conclude that success “lies in the organization's ability to provide an overall climate and culture for change through its various decision-making systems, operating systems, and human resource practices" (p.287). These assertions found validation in Venkatesh et al.’s (2000, 2003) Technology Acceptance Model (TAM) and subsequent Unified Theory of Adoption and Use of Technology (UTAUT), which highlights the importance of adequate organizational resources for the innovation, compatibility with existing systems in use, and adequate technology support for the innovation. These factors from TAM and UTAUT illustrate the importance of the information technology subunits of a given institution, and will be discussed more thoroughly in the centralization section below.

Innovation Value Chain

The innovation value chain (IVC), proposed in separate formats by Hansen & Birkinshaw (2007) and Roper, Du, & Love (2008), is a way to measure the innovation management activities of organizations and large entities, including entire countries. Various studies have used the IVC to measure the innovation supporting activities of Ireland and Switzerland (Roper & Avanitis, 2012), Japan (Kodama, 2009), and China (Guan & Chen, 2010), among others. In its simplest format, the IVC describes a sequential process of idea generation, idea conversion,

and idea diffusion under Hansen & Birksinshaw's (2007) model, or alternately, as knowledge sourcing, knowledge transformation, and knowledge exploitation under Roper, Du & Love's (2008) model.

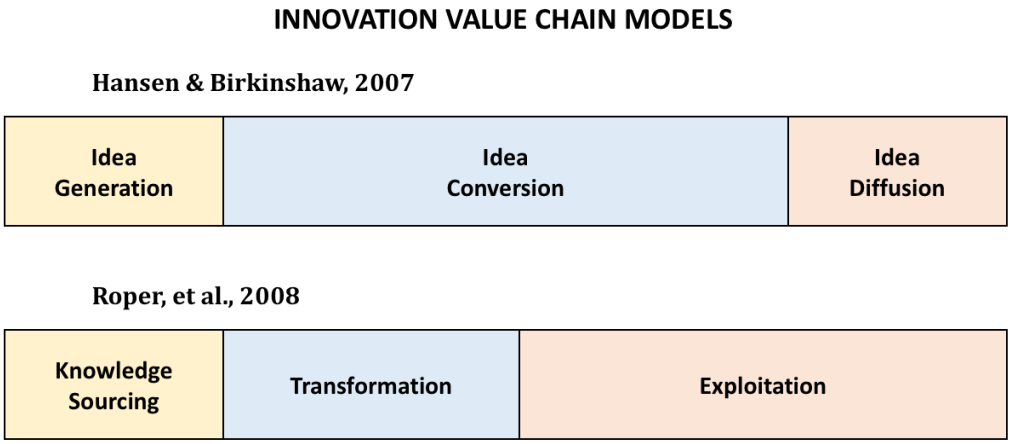

Figure 2. Innovation Value Chain Models. Adapted from Sheu & Lee (2009).

According to Hansen and Birkinshaw's (2007) model, the subcomponents of this three stage process include six important management tasks: internal sourcing, cross-unit sourcing, external sourcing, selection, development, and diffusion of the innovation within the firm. Internal sourcing is simply the generation of innovative ideas from within the firm. Cross-unit sourcing takes the internal idea generation process a step further by involving the collaboration of different units within the same organization to generate ideas. External sourcing is the process of integrating innovative ideas from outside the organization. These sourcing processes generate ideas that must then be screened through a selection process and further developed so that the resulting innovation can work within the firm. Finally, the innovations should be diffused throughout the organization. These tasks taken together constitute the organizational activities of the innovation value chain.

Hansen & Birkinshaw's (2007) paper proposes a questionnaire to quickly determine a given company's IVC strengths and weaknesses in order to focus management efforts on the revealed weaknesses. Given the many pressures previously described in this chapter, from state accountability standards to increasing competition, institutions have much to gain through understanding these factors in their performance.

The questionnaire begins with series of questions that probe the creation of new ideas within a unit, via collaboration with other units, or via sources outside of the organization. Key performance indicators are identified to show measures that can be used to validate the quality of responses. The next section covers the conversion phase of the IVC, where ideas are screened and potentially funded, and innovations are turned into viable products and business practices for the organization. Finally, the survey ends with a question about the effectiveness of innovation diffusion within the firm, where the innovation is disseminated throughout the organization (see Appendix B for the full instrument).

Roper, et al. (2008) use a more mathematical approach to explore IVC activities within corporations, particularly manufacturing firms. For example, the formula for knowledge sourcing within a firm is: $KS^{*} = \check{}KS_{kit} + \acute{}RI_{jit} + \acute{}KUC_{jit} + \acute{}GOVT_{jit} + \acute{}MKT_{jit} + \varepsilon_{jit}$, $_{jit}{}_{*}{}^{0123}(1)$ $KS_{jit} = 1$ if $KS_{jit} > 0$; (p. 963). The key difference in Roper's approach as compared to Hansen & Birkinshaw's approach is that the end result in Roper's model is an innovation that can be "exploited" (Van Horne, et al., 2006, p. 757); in other words, a product that can be sold to a customer. For this reason, Roper's approach has been used to survey innovation development activities on a national scale; the

concerns of national economies usually focus on Gross Domestic Product (GDP) and other measures which involve sales of particular goods to consumers.

In contrast, the Hansen & Birkinshaw model can be used to analyze activities within the organization that have no direct customers. Therefore, the Hansen & Birkinshaw tool is more applicable for the purposes of this dissertation.

Lane (2007) declares that "in academia, especially in scientific and medical fields, individuals appear to be strongly independent and conservative in nature, and generally skeptical of educational change" (p. 86). Put in the lenses of Hansen and Birkinshaw's IVC, what part of the chain is weakest? Is it the generation of new ideas, their conversion into actionable approaches, or their diffusion (or all three)?

Centralization Concepts

While many studies provide a framework for understanding innovation adoption from a cultural and social context, relatively few studies have focused on the importance of organizational structures as an element in innovation adoption and implementation (Gupta, Smith, & Shalley, 2006, Siggelkow & Levinthal, 2003; Westerman, McFarlan, & Iansiti, 2006), and even less so in higher education settings. Two additional factors that can be investigated under this lens include the structures of subunits within an institution and their corresponding levels of centralization.

There are a wide variety of methods to measure the centralization of organizations. Centralization can be described mathematically, as a measure of centrality and the relationship of a node to other nodes. This approach was first proposed by Alex Bavelas in 1948 to study communication within a group,

researched and refined by many scholars, and refined still further by Freeman to provide comparative data about nodes in 1978. This measure is widely used in the social sciences to describe centrality in social networks.

Using a different approach, Treisman (2002) proposed a political model of centralization which could be used for describing the relative centralization of states and nations. His model comprises six components: 1) vertical decentralization, 2) decisionmaking decentralization, 3) appointment decentralization, 4) electoral decentralization, 5) fiscal decentralization, and 6) personnel decentralization.

In Treisman's model, vertical decentralization is simply a measure of the number of tiers in an organization, from its highest level to the lowest level. Decision-making decentralization refers to the authority to make decisions at each of the tiers, and appointment decentralization concerns where hiring decisions can be made. Electoral decentralization describes the number of tiers that have direct elections. For example, in the U.S. government, the President and Congress are elected, but some positions are appointed rather than elected. Finally, fiscal decentralization concerns the percentage of revenues that are distributed to subunits within the government, and personnel decentralization is a measure of the percentage of administration that can be found at the subunit level.

Hage and Aiken (1967) created a tool to measure the level of centralization in non-profit organizations that has since been utilized, validated, and modified many times (Dewar, Whetton, Boje, 1980). The Hage & Aiken tool has been used to study a variety of organizational factors and performance indicators, from complexity and formalization (Hage & Aiken 1967) to patient outcomes (Aiken, et al., 2000) and

organizational design (Agranoff 1976). The survey consists of two parts: 1) a measure of participation in decision making, and 2) a measure of the hierarchy of authority in the organization. Later scholars, like Kaluzny, et al. (1974), also choose to measure centralization as a degree of participation in decision making, as does Ferrell & Skinner (1988).

Notably, Hage and Aiken (1971) used their measure of centralization to find its impact on innovation in a study of health care firms. The findings from this study were inconclusive on this topic because full data was not available at the time of publication. Other scholars, like Damanpour (1996) have sought to measure the impact of centralization and formalization on innovation within for-profit and non-profit firms. Damanpour found that centralization was more negatively related to innovation in for-profit organizations than in not-for-profit organizations. In Damanpour's (1996) model, centralization leads to lower risk-taking with new innovations. A lower rate of risk-taking is more harmful in for-profit firms, due to the fact that non-profit firms have greater accountability to external controls than for-profit firms (e.g., legislative funding, state and federal requirements, etc.). This added accountability for non-profits makes them more static in general than for-profit firms, and so less willing to take risks with new innovations.

Anderson and King (1993) describe a related "innovation dilemma" (p. 11) that was identified in previous studies of centralization and innovation: namely that early stages of innovation are facilitated by decentralization, while later stages are facilitated by centralization. Additionally, Kim (1980) found that centralization's impact on innovation in organizations depended on the type of organization.

Resource allocation decision-making (defined by Kim as participation in decision-making) was "significantly related to program changes in service organizations, while decision-making about work (defined by Kim as hierarchy of authority) was…significantly related to more frequent product changes in manufacturing organizations" (p. 241).

Importantly, the Hage & Aiken (1971), Damanpour (1996), Anderson and King (1993), and Kim (1980) studies did not establish the relative centralization of subunits within the firms they studied, and the potential impact of subunit structures on organizational innovativeness.

Subunits. Some scholars have asserted that subunits within a given firm can have an equally large role on the adoption and implementation process (Tushman, et al., 2010; Pennings, et al., 2014; Abrunhosa, A., & Sá, P. M., 2008). Kim (1980) states that a "plausible way to investigate the contingency relationship between organizational structure and the different phases of the innovation process may be to assume that the organization has different subunits to deal with different stages" (p. 228). However, Kim (1980) did not pursue this line of research in his paper. In higher education, subunits may consist of divisions, colleges, departments, and administrative service units. These subunits can be highly centralized or decentralized, depending on budgetary constraints and institutional cultural norms.

Tushman, et al. (2010) identify four distinct types of organizational structures based on a review of the literature. The first model, the functional structure, describes an organization based on operational units that operate as discrete business functions. Innovation scholars (Audia, Locke, and Smith, 2000;

Campbell and Park, 2005; Carroll and Teo, 1996; Christensen and Bower, 1996; Hill and Rothaermel, 2003) have focused on the inertial aspect of this organizational model, claiming that partnerships and acquisitions are essential pathways to innovation because they are necessary to overcome the internal inertia of cultural norms and senior leadership biases.

The second model, the cross-functional team structure, highlights the importance of strategic directives and technological changes, which require coordinated collaborations between units within a functional structure in order to accomplish a desired goal (Donaldson & Preston, 1995; Gresov, 1989; Miles, et al., 1978; Nadler and Tushman, 1997). These cross-functional teams focus on creating new ideas by "innovating via structural overlays" within an organization (Tushman, et al., 2010, p. 6).

The third and fourth models, as described by Christensen (1997), Wheelwright and Clark (1992), and O'Reilly and Tushman (1997), are the spin-out structure and the ambidextrous structure, respectively. Spin-outs are defined as "distinct innovation unit[s] without general manager control and/or senior team support," while ambidextrous units are described as "distinct innovation unit[s] with general manager control and senior team support" (Tushman, et al., 2010, p. 11). Spin-outs are employed to encourage new-to-the-firm innovations, while ambidextrous structures seek to promote both new ideas and expand on existing innovations.

While higher education has been organized very traditionally into functional units, all of these organizational models can be found in the subunits of public

higher education institutions. Despite the fact that the Hage & Aiken measure of centralization has been used to measure firms at the organizational level, the importance of subunits and their own varying structures and levels of centralization has been neglected. Furthermore, as innovation studies have advanced to include the process aspects of innovation management, broad measures of innovation as described in the Damanpour (1996) study appear to be insufficient for the analysis of the impact of subunit centralization as part of innovation management practices. Damanpour's research focuses on the relative innovativeness of firms, rather than the strengths and weaknesses of their innovation management practices (as determined vis-à-vis the IVC).

In an extensive review of innovation scholarship, Crossan & Apaydin (2010) delineate between innovation as outcome and innovation as process. The former is a measure of new products, services, and activities at a given firm, while the latter is a reflection of particular management practices that promote (or demote) innovativeness. This dissertation focuses on innovation as process in an effort to help institutions understand their respective strengths and weaknesses in that process. Given the financial and legislative pressures on public higher education to become more efficient (and therefore more centralized) while simultaneously becoming more innovative, it is important to know the relationship of centralization and efficiency strengths and weaknesses in innovation management.

Rationale

In conclusion, the role of higher education service units in the innovation process has not been adequately researched, and the question of which service units

to study has not been fully answered in these environments. Technology units in public higher education seem particularly ripe for study, given their potential impact in a wide variety of factors that promote innovation generation, conversion, and diffusion. While scholars like Fuller and Swanson (1992) investigated the roles of information technology subunits on organizational innovativeness, they did not factor in the relative centralization of these subunits or include educational institutions. Perhaps most importantly, they focused on organizational innovativeness as an outcome, rather than innovation as a process. Recently developed and validated measures, such as Venkatesh's (2000, 2003) TAM and UTAUT models, include a number of factors that could be impacted by the functionality and agility of local technology support units. Specific factors that affect innovation adoption, from individual apprehension to facilitating conditions like the availability of training and support, give further evidence that technology service units are very likely an important consideration in technology adoption and diffusion.

Although studies have demonstrated 1) the critical importance of innovation (Borins, 1998; Andrews et al., 2006; Christensen et al., 2004; Damanpour et al., 2009; Tidd et al., 2001), 2) the many problems involved in successfully managing innovation (Ensminger, 2005; Griffith, Zammuto, & Aiman-Smith, 1999; Meyer & Goes, 1988; Surry & Ely, 2002; Van de Ven, 1999), and 3) the cultural and resource barriers to change within organizations (Aubert & Hamel 2001; Denis et al. 2002; Fennell & Warnecke 1988; Ferlie et al. 2001; and Rogers 2003), there is inadequate research on how subunit organizational structure can influence the success of

innovation management for key technological innovations. Given that institutions of higher education are organized differently, and that technology support organizations inside each institution are also organized differently, there is a need to further understand how these structural differences may impact the innovation management process. This study will apply Hansen & Birkinshaw's (2007) innovation value chain to determine how relative centralization of technology units promotes or demotes each phase of the innovation value chain across the institution and use Hage & Aiken's (1967), Kaluzny, et al.'s (1974) and Ferrell and Skinner's (1988) survey instruments to identify the respective centralization of technology organizations in public Research One Level universities.

Many internal and external drivers—ranging from student success and institutional rankings to financial and outcome-based accountability measures—incentivize institutions of higher education. Yet each institution employs one of many organizational models due to a variety of factors specific to the institution. Studies have shown the importance of implementing new innovations in order to address these drivers. Do certain organizational models yield better results to promote various phases of the generation, conversion and diffusion of these innovations? This study will illuminate the strengths and weaknesses of specific organizational models for faculty, staff, and administrators hoping to utilize new technologies to achieve their respective and institutional goals. The larger community will benefit by being able to identify potential actions to address shortcomings in their innovation management processes, and the innovation research community will benefit from new data in an under-researched topic area.

Chapter III

Method

The purpose of this quantitative study was to apply Hage and Aiken's (1971), Kaluzny, et al.'s (1974), and Ferrell and Skinner's (1988) centralization tools to Hansen and Birkinshaw's (2007) innovation value chain tool in order to explore whether there existed a relationship between centralization and the innovation process. More specifically, the present study hoped to find a difference in the relative strengths and weaknesses in idea generation, conversion, and diffusion of technological innovations among Research One (R1) Doctoral Universities based upon the relative centralization levels of technology units. The *Research One* classification is a subcategory of classifications of higher education institutions developed by the Carnegie Foundation for the Advancement of Teaching ("The Carnegie Classification of Institutions of Higher Education," n.d.). It was expected that the number of institutions in this category would provide great depth and variety to the overall study, and that strong inferences about IT organizational structures and their relationship to innovation management activities would be derived from the resulting data. Toward this purpose, five hypotheses were tested:

Hypothesis 1. This study hypothesized that more decentralized technology structures would show greater effectiveness during the idea generation phase than more centralized structures.

Hypothesis 2. This study hypothesized that more decentralized technology units would show greater effectiveness during the idea conversion phase than more centralized structures.

Hypothesis 3. This study hypothesized that more centralized technology structures would show greater effectiveness during the diffusion phase than more decentralized structures.

Hypothesis 4. This study hypothesized that more centralized technology structures would show lower effectiveness for all three phases of the innovation value chain than more decentralized structures.

Hypothesis 5. This study hypothesized that participation in decision making measures would show more significant correlations with innovation value chain phases than hierarchy of authority measures.

Subjects

Survey participants consisted of subunit (college, school, subdivision) IT staff and managers working at R1 universities across the United States, a Carnegie classification that consists of 115 institutions. The R1 universities category was chosen because it encompasses a considerable number of institutions distributed in rough proportion to population centers throughout the United States (Figure 1), and also comprises institutions with a variety or organizational models, and sizes. Importantly, these institutions have resource levels that allow them to make choices regarding the centralization and decentralization of their subunits. Also, the range of potential decentralization is much higher at these institutions, given the size and scope of their missions and campus populations. The Carnegie Foundation identifies R1 schools as institutions with the highest research activity that awarded at least 20 research/scholarship doctorate degrees in 2015.

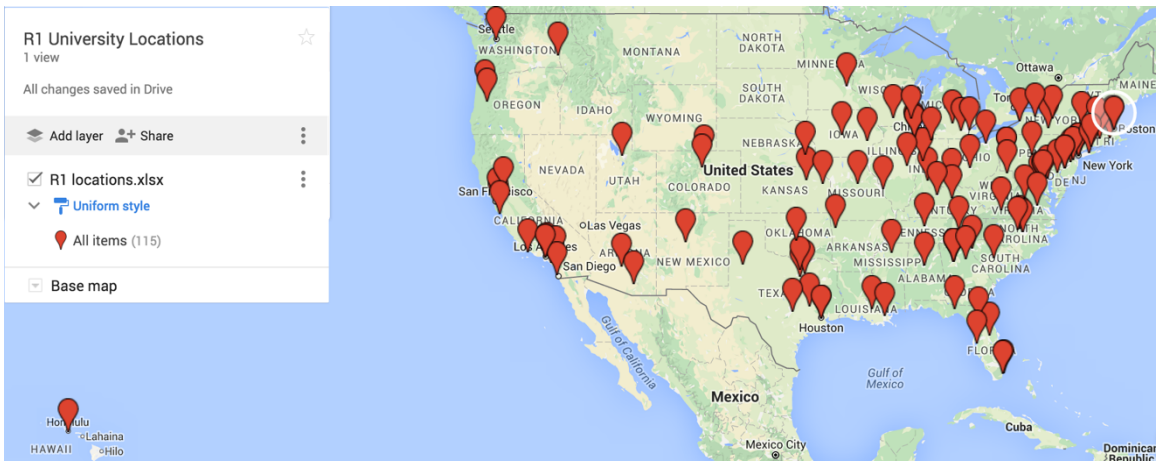

Figure 3. R1 University Locations. By Edmund Clark (2016). Source data retrieved from http://classifications.carnegiefoundation.org/.

Subunit IT workers were chosen because they were well-positioned to respond to the task independence and hierarchy of authority questions posed in the three centralization measures and because they could also provide more representative answers to the innovation value chain questions. The centralization questions were geared toward workers underneath top organizational positions, and the innovation value chain could provide a more complete picture of a given institution when multiple subunit measures of idea generation, conversion, and diffusion were taken into account.

Measures

Survey participants from each institution were asked to identify their position, subunit, and relation of their subunits to the central IT unit at each institution. Each participant was then asked to complete a single survey that combined multiple instruments created by Hage & Aiken (1971), Kaluzny, et al. (1974), Ferrell & Skinner (1988), and Hansen & Birkinshaw (2007). The first three instruments measure participation in decision-making and hierarchy of authority

(see Appendix A). The Hage and Aiken tool has been previously validated by Dewar, Whetton & Boje (1980) in a review of four previous studies, with a range from .81 to .95 for the participation in decision making measures and .70 to .96 in the hierarchy of authority measures. (See Figure X Dewar Whetton Boje 1980 below). Additionally, Kim (1980) validated the Hage and Aiken variables at .90 for participation in decision making and .68 for hierarchy of authority items. The present study adapted the Hage and Aiken tool to specifically measure these variables in IT subunits.

The Kaluzny (1974) tool has been cited in over 100 studies and builds on Hage & Aiken's participation in decision making tool by including additional organizational factors like funding and affiliation. This study adapted the Kaluzny tool to focus on technology subunit organizations and their participation in decision-making in relationship to central technology organizations. Similarly, the Ferrell and Skinner (1988) tool has been cited in over 400 studies and was adapted to demonstrate the participation in decision making for decentralized technology subunits in relationship to centralized technology subunits in higher education. One goal of this dissertation was to establish a firm correlation between all three of these centralization tools, thereby providing further validity for any subsequent linkages with the innovation value chain measures.

The Hansen & Birkinshaw (2007) innovation value chain tool (see Appendix B) made up the last portion of this single combined instrument. This tool has been cited in over 600 research papers and reflected the focus on innovation-as-process utilized in the present study. As described in Chapter 2, the Hansen and Birkinshaw

(2007) tool divides the innovation process into three main phases and six sub-phases and this dissertation attempted to find linkages between the aforementioned centralization measures and their impacts in each innovation value chain phase and sub-phase.

Procedure for Data Collection

Subjects were identified via participation in the MOR Leadership program, a national leadership development program with cohorts from over 30 R1 institutions. Data was collected from a single-stage Qualtrix survey (see Appendix A & B for the complete question list) that was distributed to subunit IT staff at each institution within current and previous MOR cohort groups. These subjects were then recruited via e-mail through MOR leadership representatives. The economy of design and rapid turnaround for data collection via Internet survey justified the use of this instrument for the present study.

Procedure for Data Analysis

Data from the survey was aggregated and then evaluated through JASP, an open-source software program for advanced statistical analysis. The identifying information of participants was redacted. The three centralization measures were normalized and combined and then correlated with the three innovation value chain sub-measures and evaluated for cross-dimensional correlations by specific participant characteristics. First, the centralization measures were tested to determine whether they were in agreement. Then, the centralization measures were tested for the strengths of their relationships in each phase of the innovation value chain. Data was scrubbed and checked for outliers, using statistical methods

and distribution charts. Finally, correlations were measured by key participant characteristics, including institution type, organizational type, and reporting type.

Chapter IV

Results

Demographic Characteristics

The survey for the present study received 525 responses. Participant responses were excluded if any of the measurement items (participation, hierarchy, generation, conversion, and diffusion) were left blank, if the respondent did not work at an R1 institution, or if the respondent was not part of an IT unit. These exclusions eliminated 222 responses.

303 centralized and decentralized IT staff at 38 R1 institutions (100% of the R1 institutions served by the MOR leadership program) fully completed the survey for the study. Of the 38 institutions, 22 were public, and 16 were private. The institutions were geographically distributed throughout the United States with locations including parts of the Northern, Southern, Eastern and Western regions of the country. Taken together, these 38 institutions constitute approximately one third of the 115 R1 institutions in the United States.

The subjects were made up of 168 centralized (55.4% of the total) and 111 decentralized (36.6%) technology staff, along with 24 additional technology staff (7.9%) that held joint reports to both central and non-central units. Positions ranged from system administrators to CIOs, with great variety in between, including academic technology staff and desktop support specialists.

Private university respondents included 91 survey responses, or 30% of the total responses, while public university respondents made up the remaining 212 responses (70%). Of the private institution responses, 54 (59.3%) came from

centralized IT positions, 32 (35.1%) from decentralized positions, and 5 (5.5%) from joint-reporting positions. Of the public institution respondents, 114 (51.6%) were centralized IT positions, 79 (37.3) were decentralized, and 19 (9%) were joint reports.

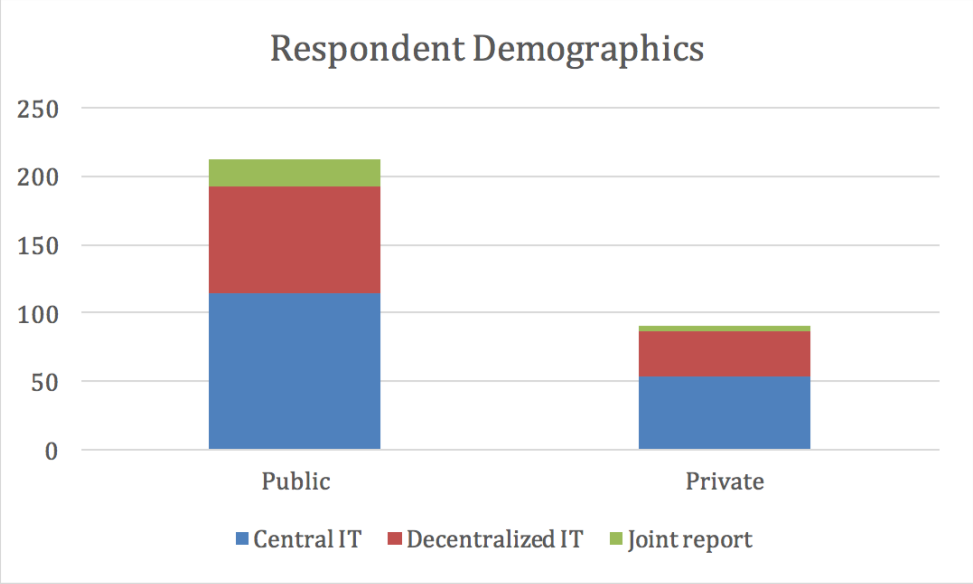

Figure 4. Respondent Demographics. Edmund Clark (2016). Source data from survey results.

Participation in Decision-Making

Participants were asked to complete a single survey that included two separate instruments to measure participation in decision making: 1) four questions with a five-point scale (low of 0 to high of 4, with a maximum score of 16) adapted from Hage & Aiken's (1971) tool, and 2) six questions with a 3-point scale (0-2, with a maximum score of 12) adapted from Kaluzny, et al., (1974). Higher scores from these instruments indicated lower participation, and therefore more centralization. These questions were intended to probe to what extent the respondent was involved with organization-wide decisions involving new initiatives, new hires, and funding for technology (see Appendix A).

These measures were then scored; normalized by converting each score into a percentage of the possible total ($\frac{Participation1}{16}$; $\frac{Participation2}{12}$); and then converted into a single participation score ($\frac{Participation1+Participation2}{2}$). The resulting scores ranged from a single score of 0 (or 0%)—meaning that this person participated in every institutional IT decision-making process—to three scores of 1 (or 100%), meaning that these individuals never participated in institutional IT decision-making. The correlation between the two participation measures was large (*r* = .65), with a mean score of .6159 (out of a maximum score of 1.0) for the first test and a mean score of .5674 for the second test. The correlations reliably predicted each other, but utilizing a similar point scale would have likely resulted in a closer correlation between the two measures. The total participation score distribution skewed high, which indicates lower participation in the decision-making process (see Figure 5).

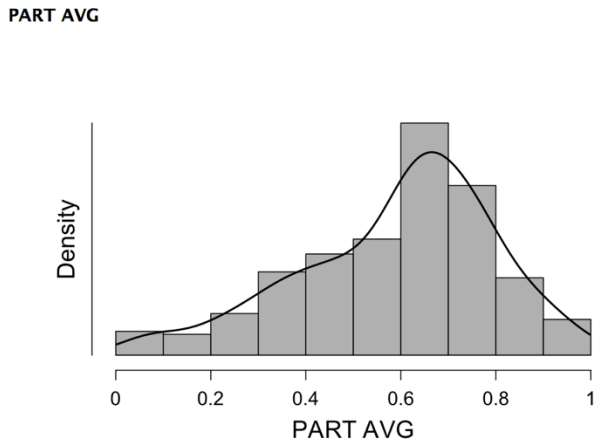

Figure 5. Distribution of Participation in Decision-Making scores. Edmund Clark (2016). Source data from survey results.

Hierarchy of Authority

The survey for the present study also contained two instruments to measure the hierarchy of authority experienced by each individual at their institution when it came to technology activities; or in other words, to what extent the individual could act without asking for permission from a superior or central authority. These measures were similarly constructed, and consisted of five questions adapted from Hage & Aiken (1971) on a 4-point scale (low of 0 to high of 3 for each item, maximum score 15) along with five questions adapted from Ferrell & Skinner (1988) on a similar 4-point scale (0-3 for each item, maximum score 15). As with the previously discussed participation measures, higher scores indicate less freedom to act, and therefore more centralization. The hierarchy scores showed a large and very reliable correlation (r = .82) and ranged from four scores of "0" (meaning that no permission was ever needed to act) to "1" (meaning that no action could be taken without permission). Not surprisingly, three of the four "0" scores came from highly-ranked staff with titles of CIO or Deputy CIO.

The resulting hierarchy measures were then scored and normalized using a similar approach ($\frac{Hierarchy1}{15}$; $\frac{Hierarchy2}{15}$), and subsequently averaged to create a total hierarchy score ($\frac{Hierarchy1+Hierarchy2}{2}$). The mean score for the first hierarchy measure was .3328, while the mean score for second hierarchy measure was .3302. The hierarchy scores skewed low and were abnormally distributed towards independence, as seen in Figure 6. This result seems consistent with the size and relative decentralization of these research institutions.

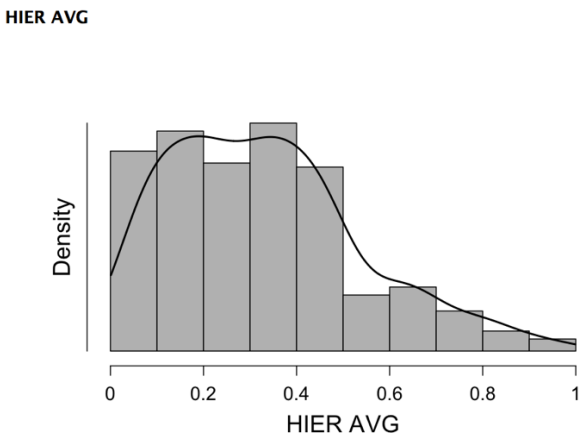

Figure 6. Distribution of Hierarchy of Authority scores. Edmund Clark (2016). Source data from survey results.

Centralization Score

The final derived measure was a centralization score for each response, which was composed of the participation score ($\frac{Participation1+Participation2}{2}$) added to the hierarchy score ($\frac{Hierarchy1+Hierarchy2}{2}$) to create a total. These centralization scores ranged from 16.66 to 170.41 and were distributed normally, as seen in Figure 7. The centralization measure was used as the independent variable to

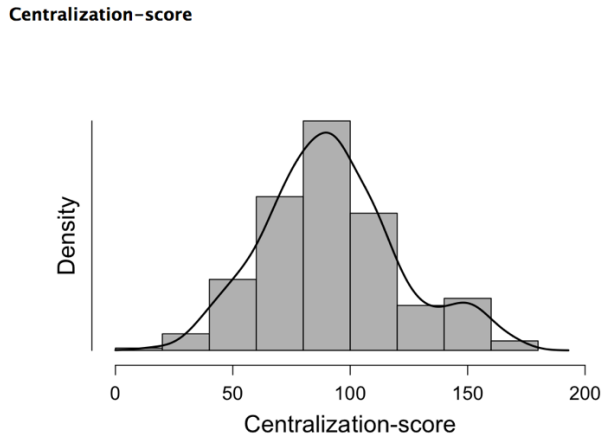

Figure 7. Distribution of Centralization scores. Edmund Clark (2016). Source data from survey results.

determine correlations with the innovation generation, conversion, and diffusion measures.

Innovation Value Chain

The survey used for the present study also contained one final element. The innovation value chain questions developed by Hansen & Birkinshaw (2007) attempt to measure the strength and weakness of innovation generation, conversion, and diffusion activities in an organization. These questions consisted of six questions relating to idea generation on a 3-point scale (low of 1 to high of 3, maximum score 18); four questions relating to idea conversion on a 3-point scale (1-3, maximum score 12); and three questions relating to diffusion on the same 3-point scale (1-3, maximum score 9). Higher scores in each of these categories indicated poorer performance.

Findings

Results: Innovation Generation, Conversion, and Diffusion as a Function of Centralization

(Note that larger correlations indicate more negative impacts)

	Sample (*n*)	Idea Generation (*r*)	Conversion (*r*)	Diffusion (*r*)
All Responses	**303**	**0.33***	**0.29***	**0.08*****
Central Staff	*168*	*0.35**	*0.27**	*0.08****
Decentralized Staff	*111*	*0.31**	*0.29***	*0.15****
Joint Reports	*24*	*0.29****	*0.5***	*0.04****
Private Institutions	**91**	**0.40****	**0.33****	**0.33****
Private (Central Staff)	*54*	*0.30***	*0.29***	*0.40***
Private (Decentralized Staff)	*32*	*0.51***	*0.39***	*0.30****
Private (Joint Reports)	*5*	*0.78****	*0.69****	*0.40****
Public Institutions	**212**	**0.30***	**0.27***	**-0.04*****
Public (Central Staff)	*114*	*0.38**	*0.28***	*-0.07****
Public (Decentralized Staff)	*79*	*0.19****	*0.24***	*0.04****
Public (Joint Reports)	*19*	*0.11****	*0.45***	*0.01****

* $p < .001$

** $p < .05$

*** $p > .05$

Figure 8. Innovation generation, conversion, and diffusion as a function of centralization. Edmund Clark (2016). Source data from survey results.

The centralization score for all institutions had a moderate and positive correlation to the generation of ideas score (r = .33, DF = 302, p < .0001). This result means that increased centralization resulted in more negative effects for idea generation. Therefore, the first hypothesis was supported: that more decentralized technology structures would show greater effectiveness during the idea generation phase than more centralized structures.

It was hypothesized that more decentralized technology units would show greater effectiveness during the idea conversion phase than more centralized structures. The centralization score for all institutions had a weak but positive correlation to the conversion score (r = .29, DF = 302, p < .0001). This result means that more centralization led to more negative performance in idea conversion. Therefore, the second hypothesis was supported by the study.

The third hypothesis, that more centralized technology structures would show greater effectiveness during the diffusion phase than more decentralized structures, was not supported by the data. The correlation between the centralization score and the diffusion score was nonexistent (r = .08). Strangely, the negative impact of centralization on the diffusion score in private schools was significant and negative (r = .33, DF = 90, p = .0013). This finding is surprising, in that it suggests that centralization at public institutions has almost no impact on the diffusion process, while it has a moderately negative impact at private institutions.

The fourth hypothesis, that more centralized technology structures would show lower effectiveness for all three phases of the innovation value chain than more decentralized structures, was supported by the data. In the all-institution results, higher centralization resulted in lower innovation process scores in generation, conversion, and diffusion ($r = .33$, $p < .0001$; $r = .29$, $p < .0001$; and $r = .08$, respectively). When reviewing central staff responses on their own, the same pattern emerged ($r = .35$, $p < .0001$; $r = .27$, $p < .0004$; and $r = .08$, respectively). Decentralized staff also saw this pattern, with slightly more significant negative impacts on diffusion ($r = .31$, $r = .29$, and $r = .15$, respectively). Interestingly, joint reports ($r = .29$, .50, and .04, respectively) saw the largest correlation on the conversion phase, but the sample size for this group included only 24 responses. Also of interest was that private institutions saw much larger correlations ($r = .40$, .33, and .33, respectively), than public universities, which yielded the only results that were positive (but at a nonsignificant level) for diffusion ($r = .30$, .28, and -.05, respectively).

Finally, it was hypothesized that participation in decision-making measures would show more significant correlations with innovation value chain phases than hierarchy of authority measures. Such a finding would echo the validation studies conducted by Dewar, Whetton & Boje (1980), in which participation in decision making was found to be slightly more impactful in the four studies reviewed than the hierarchy of authority measures (.95, .92, .93, and .81 for the participation measure vs. .79, .96, .93, and .70 for the hierarchy measure). Surprisingly, the study did not support the hypothesis. Participation scores impacted generation,

conversion, and diffusion with Pearson coefficients of .22, .18, and .18; while hierarchy scores showed impacts of .24, .23, and -.07 respectively. This may indicate that the type of organizations studied (e.g., manufacturing, government, education, etc.) have important effects on the power of these measures.

Institution type and joint reporting structures as emergent factors

The two strongest results that emerged that were not anticipated by this study were: 1) that the innovation value chain was much more adversely impacted by centralization in private institutions than in public institutions, and 2) that joint reports saw a strong (r = .50) adverse impact of centralization on conversion. These findings merit further investigation.

In order to validate this finding, a Tietjen-Moore statistical test was conducted to determine whether there were significant outliers in the centralization, generation, conversion, or diffusion scores for private institutions. One centralization score was eliminated from the data and three values were eliminated from the generation scores; however, correlations did not change significantly (r = .39., .34, and .35 vs. r = .40, .33, and .33, respectively).

Private universities did not have significantly higher centralization scores than public universities (mean scores of 93 and 92, respectively). However, decentralized staff reported much higher and more negative impacts from centralization (r = .51, .39, .30) than centralized staff (.30, .29., .40). Both sets of numbers clearly indicate that private institutions experience negative innovation process issues as centralization increases, and this problem is seen both by centralized and decentralized staff. That this pattern emerged in private institutions

rather than in public institutions may reflect a number of moderating factors, including budget (15 of the 20 highest-endowed R1 universities are private institutions, perhaps large budgets produce more static environments), organizational structures (centralization may be more reflective of hierarchical and bureaucratic structures utilized in public schools) and culture (perhaps private schools are more culturally entwined with tradition, potentially slowing the generation, conversion, and diffusion of new ideas).

Joint reports occupied a small but interesting portion of the data for the present study. Staff with joint reports strongly indicated a negative effect of centralization on the conversion process. It is possible that the nature of these positions—bridging local and central units—could place them at the front lines where new ideas are converted into services to be diffused throughout the rest of the institution. Such striking results are worthy of a larger investigation.

Chapter V

Discussion

Higher education in the United States faces an unprecedented collection of simultaneous challenges after many decades of relative stasis. These challenges come in the form of new business models, new student populations, new competition, and new technologies. As financial pressures mount, many institutions have turned to organizational centralization as a way to increase efficiency and maximize operational investments. However, the case for centralization has arisen concurrently with an equally strong case for innovation. Calls for reform in American higher education have reached a new crescendo as tuition has spiraled upward, student debt has increased, and smaller schools have begun to fail at ever-growing rates.

In recognizing these challenges, this research study sought to isolate commonly known attributes of centralization and focus on variables that could be more easily controlled by institutions regardless of organizational structure. Two factors with a high level of validation in previous studies, participation in decision-making and hierarchy of authority, were selected as measures of centralization that could be more easily changed at an institutional level than other measures (e.g., political structures, budget models, etc.).

These variables were then combined to create a centralization score in order to determine how impactful this type of centralization was on the innovation process. Given the increasing importance of technology for innovation in all fields, including education, this study focused on IT support units and their staff at R1

universities, which represent the flagship institutions for American higher education.

Data was gathered from 303 IT workers at 38 R1 institutions representing states including California, Connecticut, Georgia, Illinois, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Texas, Washington, and Wisconsin. The results were compiled and analyzed for population segments, institutional type, score distributions, and score correlations via JASP and Microsoft Excel.

Summary of Findings

Participants in the present study found that centralization had negative impacts on idea generation and conversion (see Figure 8). The scale of these impacts ranged from weak to strong, depending on the institution type, the position type, and the position reporting model. Surprisingly, the impact of centralization on the diffusion process seemed to show extremely mixed results and varied greatly depending on whether the institution was public or private.

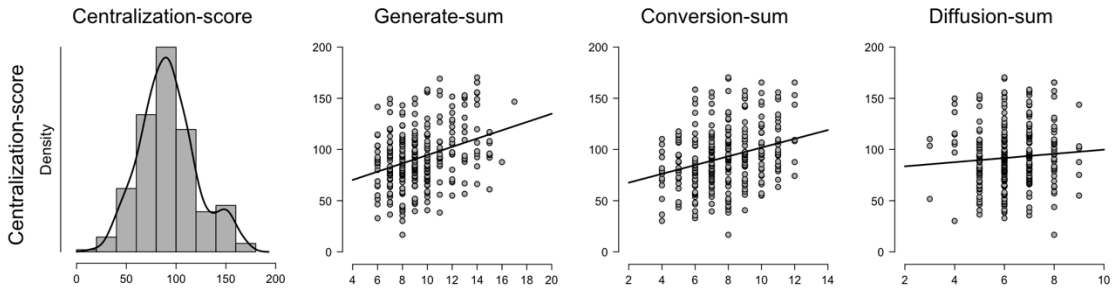

Figure 9. Correlation plots for centralization to generation, conversion, and diffusion. Edmund Clark (2016). Source data from survey results.

The hypothesis that centralization would adversely impact the idea generation process was supported, as was the hypothesis that centralization would also have negative impacts for conversion. These findings are significant in that present study has controlled for the types of institutions studied (R1 institutions) as well as the subtype of organization (IT support units), and so has therefore established some measure of control for potentially moderating variables such as size, slack resources, specialization, and functional differentiation (Greenhalgh, et al., 2004). These correlations were found regardless of institution type (public or private), organization type (centralized or decentralized) or staff reporting type (centralized, decentralized, or joint). However, the variable of institution type was shown to be important, as there were significant differences in results from public vs. private institutions.

Perhaps the most striking example of this difference is the finding that centralization had widely different impacts on innovation diffusion at these two types of institutions. The overall impact for publics was nonsignificant (r = -.05, range = -.07 - .04), while the impact for privates was negative and much more powerful (r = .33). The fact that both centralized and decentralized staff at private schools agreed on this finding (range of r = .30-.40) calls for a focused investigation on this issue.

One possible explanation is that public schools exhibit more bureaucratic structures than private schools, and therefore are less impacted by increased centralization. This hypothesis would require a comparison and evaluation of organizational structures at these institutions. However, one would also have to

explain why this increased centralization only had a significantly different impact on innovation diffusion. It is possible that bureaucratic controls on the diffusion of a new innovation are more acceptable at public universities than at private universities.

Budget size is another possible explanation. It is possible that extremely wealthy institutions are less prone to diffuse new innovations because they are under fewer pressures to do so. Therefore, intentional diffusion through centralization would have a negative effect on the process, and would be culturally incompatible.

Another potentially significant finding was that joint reports saw much different patterns in the relationship between centralization and the innovation process. For these individuals, idea conversion was the most negatively impacted from centralization. These results are not as reliable as the other findings, given the small sample size of this population (n = 24). However, the mean of the conversion scores was not significantly different from that of the total population (μ = 7.79 vs. 7.77, respectively). One potential explanation is that these staff occupy a space where idea conversion is more likely to occur. In order to investigate this, one could conduct a study to examine what types of innovations are more likely to be seen by this population as well as how they function within the innovation process continuum.

Implications

The implications of these findings are significant, in that the centralization factors used for the present study are theoretically under of the control of managers

and supervisors, regardless of organizational structure or institution type. Irrespective of budget factors or reporting models, a large number of potential interventions could be employed to increase participation in decision-making while allowing individuals to make more local decisions to try new technologies and processes. For the former, greater employment of communication and feedback mechanisms could increase participation while simultaneously improving working relationships with decentralized units. In order to control for the potential negative effects of the latter, an organization could specify lengths of time for new pilots while ensuring that pilots are actively encouraged and that results are shared widely (whether positive or negative).

The present study sought to establish a connection between more controllable aspects of centralization and their impacts on the innovation process. Given the many challenges facing higher education, an intensified focus on innovation will be necessary to ensure that institutions survive and thrive as they move into new and uncharted waters. While increasing centralization and efficiency may be mandated by executive boards and state legislatures, there is hope that it is possible to accomplish such goals while protecting and fortifying the innovation process. The results of this study suggest that there are indeed ways to prevent certain aspects of centralization from disrupting the generation and conversion of new ideas.

Strengths and Limitations

The strengths of the present study include four primary items: 1) a new operationalization of previously validated centralization instruments on the

innovation value chain, 2) a discovery of important factors that impact the innovation process at R1 institutions, 3) a discovery that the type of institution has an important effect on innovation diffusion, and 4) a contribution to new knowledge in the study of higher education in the United States.

The present study was the first to employ Hage & Aiken's (1971) measures of participation in decision-making and hierarchy of authority to determine impacts on the innovation process as measured by Hansen & Birkinshaw's (2007) innovation value chain tool. This operationalization helped to further isolate how centralization adversely impacts the innovation process, thereby contributing to the ever-expanding body of innovation research.

By utilizing the tool developed for the present study, intriguing correlations were discovered between the centralization measure and each phase of the innovation value chain. These correlations suggest that institutions should carefully evaluate how well they enable participation and local decision-making as they work through the innovation process.

The discovery that private universities suffer from centralization in different and more powerful ways than public universities is an important finding. This suggests that there are significant moderating circumstances that must be accounted for when comparing public and private R1 institutions, and that they are not as homogenous as sometimes believed.

Finally, the present study contributed to the body of knowledge of higher education in the United States by expanding understanding of the importance of IT

subunits in the innovation process as well as the highlighting key variables that affect the innovation process at these institutions.

The present study also had some notable limitations. First, the institutions that responded may not adequately represent the entire body of American R1 institutions. Certain geographical regions of the country, including the Southeast and Southwest, were either inadequately represented or not represented at all. Furthermore, it is unknown how well findings at these 38 R1 institutions would translate for the vast majority of institutions that occupy other tiers in the Carnegie classification system.

Second, the use of a national IT leadership development program to determine participants has limitations in that the population reflects a top-heavy population (i.e., more often, higher ranking managers). It is possible that including more staff at the operational level (e.g., programmers, system administrators, desktop technicians, etc.) would change these results significantly. Moreover, entry into the MOR Leadership Program requires sponsorship from the central IT office (usually from the CIO of the institution), so the relationships between these populations of decentralized and centralized staff may not typify standard relationships at these types of institutions.

Finally, as in any study of this scope, the potential importance of moderating variables looms large. In Greenhalgh, et al.'s (2004) review of innovation diffusion literature, organizational factors such as size, maturity, functional differentiation, specialization, slack resources, and decentralization taken together had a .39 correlation with innovation adoption and diffusion. In this respect, the findings of

the present study are extremely significant, in that decision-making and hierarchy of authority made up an extremely large portion (.33, .29) of this total.

However, one could theorize that moderating variables, like organizational size, should be accounted for more specifically in these correlations. Because Damanpour's (1996) study defined large organizations as any organizations with more than 500 employees, all institutions in this study qualified as large. Therefore, size would be a hidden variable with an effect that must be accounted for. (In fact, all R1 institutions would qualify as "large" under this definition, so new ways of discovering the impact of organizational size must be developed and investigated in this sector.) A large meta study of 53 related studies conducted by Camison-Zornoza et al., (2004) found a correlation between size and innovation at (r = .15). However, this study did not include educational institutions. Illustrating the mixed results found in this area of research, Damanpour's (1996) study on centralization and innovation found that "the effect of size on centralization-innovation was nonsignificant" (p. 11).

While it is possible that other variables discussed by Greenhalgh, et al. (2004) (namely, functional differentiation, specialization, and slack resources) beyond those previously discussed in the present study (participation in decision-making, hierarchy of authority, and organizational size) have extremely small impacts on innovativeness, it is unlikely. Therefore, each of these variables should also be isolated, measured, and correlated to find to what extent they serve as moderating variables for this study and others like it. While the focus of the present study on IT subunits and R1 institutions has substantially controlled for these

variables, there is nearly always room for improvement, especially in creating an operational continuum for each of these variables. These limitations have the potential to limit the generalizability of the findings in the present study.

Recommendations for further research

The results from the present study, along with its concomitant strengths and weaknesses, yield several recommendations for further investigation. First, the study could be expanded to include a greater representation of all IT workers, including workers that do not participate in the MOR program, as well as including more types of institutions. Such a study could be conducted with a more encompassing distribution list, like that of Educause. Including this expanded population could reveal new patterns and correlations between centralization and the innovation process.

Second, the finding of differences in the centralization-innovation process between public and private R1s has the potential to be a fruitful area of research. These moderating factors should be identified and measured so that future research in higher education innovation can account for these differences. It is possible that identified moderators could also apply to other types of institutions and situations.

Finally, the impact of the joint reporting structure in IT subunits should be investigated more thoroughly. It is possible that increasing centralization demands will result in population growth for this type of position, and therefore it is important to understand the unique challenges and opportunities confronted by this group of individuals. The idea that specific types of reporting arrangements can

have important impacts on the innovation process may uncover a fertile area of new research.

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Appendix A

Centralization Assessment Combination Instrument

(Adapted questions with original versions of these questions in brackets and bold text)

Instrument 1: Hage & Aiken (1971). Centralization (measured in 2 parts).

(Part 1) Participation in decision-making
1. How frequently do you usually participate in the decision on the adoption of new programs? **[Original version: same]**
2. How frequently do you usually participate in decisions on the adoption of new policies? **[Original version: same]**
3. How frequently do you usually participate in the decision to hire new staff? **[Original version: same]**
4. How frequently do you usually participate in the decisions on the promotions of any of the professional staff? **[Original version: same]**

(*Response set: 1, always through 5, never*)

(Part 2) Hierarchy of authority
1. Any technology decision I make has to have approval from the central IT unit. **[Original version: Any decision I make has to have my boss' approval.]**
2. There can be little action taken here until a central IT supervisor approves a decision. **[Original version: There can be little action taken here until a supervisor approves a decision.]**
3. A person who wants to make their own technology decisions would be quickly discouraged. **[Original version: A person who wants to make his own decisions would be quickly discouraged.]**
4. Even small matters have to be referred to someone higher up for a final answer. **[Original version: Even small technology matters have to be referred to someone higher up for a final answer**.]
5. I have to ask the central IT unit before I do almost anything. **[Original version: I have to ask my boss before I do almost anything.]**
(*Response set: 4, definitely true; 3, more true than false; 2, more false than true; 1, definitely false*.)

Instrument 2: Kaluzny, et al., (1974). Participation in decision-making.

The index of participation in decision making was based on the extent to which individuals indicated participation in decisions concerning the following items:
(1) allocation of overall organization technology funds,
[Original version: (a) allocation of total organizational income]

(2) adoption and implementation of new organization-wide technology programs and services,
[Original version: (b) adoption and implementation of new organization-wide programs and services]
(3) development of formal affiliation with other technology organizations,
[Original version: (c) development of formal affiliation with other organizations]
(4) appointment and promotion of administrative technology personnel,
[Original version: (d) appointment and promotion of administrative personnel]
(5) appointment of technology staff members, and
[Original version: (e) appointment of medical staff members, and]
(6) long-range planning for new organization-wide technology programs and services.
[Original version: (f) long-range planning for new hospital-wide programs and services]
(*Response set: (1) considerable participation, (2) some participation, and (3) no participation*.)

Instrument 3: Ferrell & Skinner (1988). Hierarchy of authority.

1. Any major technology decision that I make has to have approval from the central IT unit.
[Original version: Any major decision that I make has to have this company's approval.]
2. In my dealings with the central IT unit, even quite small matters have to be referred to someone higher up for a final answer
[Original version: In my dealings with this company, even quite small matters have to be referred to someone higher up for a final answer.]
3. My dealings with the central IT unit are subject to a lot of rules and procedures stating how various aspects of my job are to be done.
[Original version: My dealings with this company are subject to a lot of rules and procedures stating how various aspects of my job are to be done.]
4. I have to ask central IT unit representatives before I do almost anything in my local IT unit.
[Original version: I have to ask my company reps before I do almost anything in my business.]
5. I can take very little action on my own until the central IT unit or its representatives approve it
[Original version: I can take very little action on my own until this company or its reps approve it.]
(*Response set: 4, definitely true; 3, more true than false; 2, more false than true; 1, definitely false*.)

Appendix B

Innovation Value Chain Survey

(Hansen & Birkinshaw, 2007)

	Activity	Phase
Our culture makes it hard for people to put forward novel ideas	In house idea generation	High scores indicate that your company may be an idea-poor company
People in our unit come up with very few good ideas on their own		
Few of our innovation projects involve team members from different units or subsidiaries	Cross-pollination among businesses	
Our people typically don't collaborate on projects across units, businesses, or subsidiaries		
Few good ideas for new products and businesses come from outside the company	External sourcing of ideas	
Our people often exhibit a "not invented here" attitude -- ideas from the outside aren't considered as valuable as those invented within		
We have tough rules for investment in new projects -- it's often too hard to get ideas funded	Selection	High scores indicate that your company may be an conversion-poor company
We have a risk-averse attitude toward investing in novel ideas		
New-product-development projects often don't finish on time	Development	
Managers have a hard time getting traction developing new businesses		
We're slow to roll out new products and businesses	Diffusion	High scores indicate that your company may be an diffusion-poor company
Competitors quickly copy our product introductions and often make pre-emptive launches in other countries		
We don't penetrate all possible channels, customer groups, and regions with new products and services		

(Response Set: 1, Do Not Agree; 2, Partially Agree; 3, Agree)

Adapted Hansen & Birkinshaw questions used for the present study:

(a) Our institutional culture makes it hard for people to put forward novel ideas.
(b) People in my unit/division/college come up with very few good ideas on their own.
(c) Our innovation projects rarely involve team members from units outside of my division/college.
(d) Our people typically don't collaborate on projects across units, divisions, and colleges.
(e) Good ideas for new services and educational offerings rarely come from outside the institution.
(f) Our people often exhibit a "not invented here" attitude -- ideas from the outside aren't considered as valuable as those invented within.
(g) We have tough rules for investment in new projects -- it's often too hard to get ideas funded.
(h) We have a risk-averse attitude toward investing in novel ideas.
(i) New innovation projects often don't finish on time.
(j) Academic leaders have a hard time getting traction developing new educational offerings.
(k) Our institution is slow to roll out new services and educational offerings.
(l) Our services and educational offerings are quickly copied at other institutions.
(m) We don't penetrate all possible channels, customer groups, and regions with new services and educational offerings.

(Response Set: 1, Do Not Agree; 2, Partially Agree; 3, Agree)