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The Future of Higher Education for Land-Grant Institutions: Considerations Beyond Short-Term Strategic Planning

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THE FUTURE OF HIGHER EDUCATION FOR LAND-GRANT INSTITUTIONS: CONSIDERATIONS BEYOND SHORT-TERM STRATEGIC PLANNING

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ABSTRACT

This research addresses future challenges for land-grant universities and calls on administrators to look beyond short-term strategic planning. Chapter One frames the research problem and presents a brief history of U.S. higher education defined by disruption and evolution. Statistical models provide a basis to identify future challenges for land-grant universities. I then propose to address those challenges by investigating University Industry Partnerships (UIP), increasing research productivity, and fostering sense of belonging for part-time graduate students. I use a systematic literature review of UIP structuring practices to reveal how UIPs are structured by time, personnel, and flexible horizontal organizational structures. I then use hermeneutical interpretative policy analysis to examine university research policies and research productivity. Findings from this policy analysis indicate institutional policies can positively influence research productivity when accompanied by investment in support and coordinated communication; consequences of institutional research policies are priorities are also addressed. Finally, I conducted a quantitative study to examine sense of belonging for part-time graduate students. Data analysis suggests existing measures of SB may need revision to accurately capture SB for part-time students. Findings indicate that positive academic outcomes are associated with higher levels of SB for part-time graduate students.

DEDICATION

I dedicate this dissertation to my husband Jeremy. The many hours of studying, writing, and research would not have been possible without his love and support.

ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. Michelle Boettcher. Thank you for bravely supporting me on this journey – may it not be our first adventure, not our last. To my other committee members, Dr. Tony Cawthon, Dr. Eliza Gallagher, and Dr. Kristin Walker-Donnelly, thank you for every tough question, helpful resource, and encouraging word. I would also like to thank my supportive supervisors, past and present, and colleagues who encouraged my work and inspired me to press on.

Finally, this work would not be possible without the research of other scholars. I extend gratitude to Hoffman et al. (2002) for permission to use their Sense of Belongingness Scale in my own research. The writings of Gavazzi and Gee (2018), Strayhorn (2019), and Alexander (2020) also provided a foundation for this line of inquiry – all to whom I am grateful.

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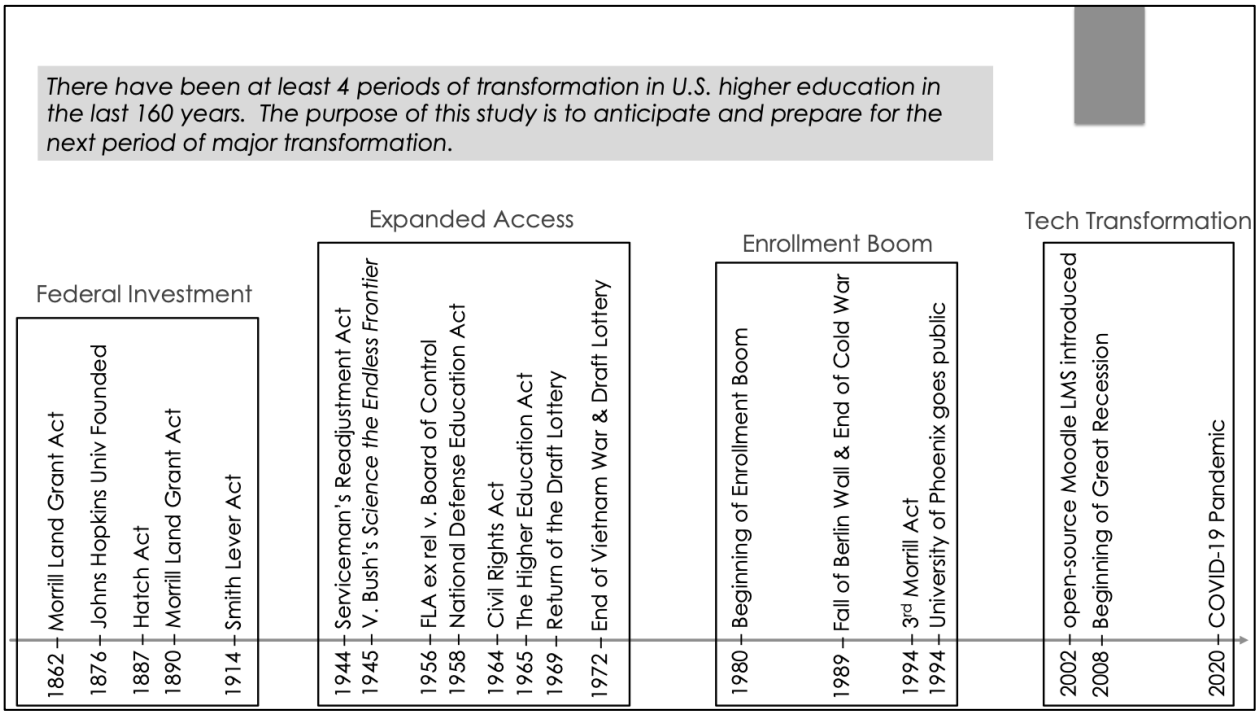
Research Problem

Many disciplines, industries, and business sectors with rich histories appear resilient and resistant to disruption, until that is no longer the case. Alexander the Great built the library of Alexandria in 300 BC, and for centuries the work of libraries remained unchanged – until the advent of the internet disrupted and transformed the library sciences (Murray, 2009). Amazon ultimately disrupted the business model of brick-and-mortar booksellers after the industry had remained unchanged for centuries (Lyons, 2011). Modern photography dates to the 1830s and the invention of the daguerreotype, 150 years later advancements in technology and the invention of digital cameras in the 1980s transformed the medium and brought about the collapse of industry giants including Kodak (Clay, 2019; Gernsheim, et al., 2020).

Like many of the industries mentioned above, higher education appears resilient and stable, capable of adapting and surviving market disruptions. The institution of higher education is steeped in tradition and history which contributes to its perceived stability. Arguments in defense of higher education's resilience often point to the founding of the University of Bologna in 1088 and of U.S. universities, some of which pre-dated the founding of the nation, as evidence of the endurance of the institution itself (Labaree, 2017; Owen-Smith, 2018). However, modern higher education in the U.S. bears little in common with U.S. higher education at the end of the 19th century. Modern U.S. higher education is largely a product of more recent legislation and events including the GI Bill, the Civil Rights Act, advancements in technology, and internationalization. The current model of higher education has evolved dramatically since World War II and is an evolving ecosystem susceptible to regular disruption (Figure 1). Crow and Dabars (2018) argued that the American research university more specifically relies on models developed in the late 19th century and is overdue for a reimagining and restructuring.

Figure 1

Timeline of Transformations in U.S. Higher Education



It is a mistake for leaders in higher education to believe that our current model is immune to disruption simply because the institution has withstood dramatic restructuring or collapse in the past. In his book *A Perfect Mess,* Labaree (2017) argued that the U.S. system of higher education is resilient and effective because of its response to market forces which have created a chaotic, complex, and hypocritical structure. Navigating changes in demand and markets for higher education requires laser-focus on *the why* behind the business of higher education – creating an educated citizenry to support a democratic society. Simon Sinek (2009) addressed the importance of *the why* through his concept of the golden circle in his 2009 Ted Talk and subsequent book *Start with Why*. Sinek argued that great leaders start by questioning why they do what they do, then consider how they do what they do, before answering the question of what they do. Labaree (2017) suggested that the real rationale, or why, behind pursuing higher

education in the U.S. is that by the 20th century "college had become the primary mechanism for middle-class families to pass on social advantage to their children and for working-class families to give their children access to middle-class jobs" (p.180). Today administrators must wrestle with a number of *whys* associated with the enterprise of higher education including but not limited to (a) the fundamental pursuit of learning, (b) a pathway to economic security, (c) infrastructure for fundamental research, (d) support for national defense and security, and (e) as an industry which supports countless families, small towns, and regional economies.

In their book *Higher Education's Road to Relevance* Ambrose and Wankel (2020) called on higher education to, "view itself as being in the learning business" (p.3). The key to ensuring that higher education remains relevant and resilient in the 21st century is dependent on this fundamental shift in thinking from what – to why. If higher education continues to view itself as only a degree granting and research producing business, it may be upended as Netflix replaced Blockbuster, as Uber disrupted the taxi industry, and Amazon replaced brick and mortar booksellers.

Research Purpose

The goal of my research is to challenge leaders in higher education to consider and prepare for the future of higher education – beyond the five to ten-year strategic plan. Both leaders and researchers in higher education have a natural orientation towards understanding the past and solving problems in the present. University presidents and administrators often craft strategic plans with each new administrative iteration, with few plans looking beyond ten years into the future. Further complicating this narrow-sighted approach is the desire of many institutions to improve their Carnegie-class rankings rather than pursue policies and initiatives that respond to real-world needs (Christensen & Eyring, 2011). Scholars in education examine a

wide-range of important issues – but our research is largely reactive to current trends rather than proactively anticipating future challenges. My research will prepare on the preparing land-grant universities to address and adapt to the future of higher education. I specifically examined land-grant universities as a context and setting because of their unique missions, history, the number of students they collectively serve, and the commonalities they share with other institutional types within the U.S. higher education system.

Researchers in science, technology, engineering, and mathematics (STEM) fields have adopted a forward-thinking perspective as they explore emerging challenges and technologies related to Industry 4.0 (Vaidya et al., 2018). Researchers in the field of education must also adopt a forward-thinking orientation and contribute to the body of knowledge and preparation for "Higher Education 4.0." My research addresses this shortcoming by contributing to the body of research focused of preparing for the future of higher education – particularly the future beyond typical short-term strategic plans.

Even amidst the COVID-19 pandemic some called for leaders in higher education to consider what higher education will look like in 2050 (Alexander, 2020; Maloney & Kim, 2020). The COVID-19 pandemic is a recent example of how predictable events, like a global pandemic, can disrupt the institution absent of planning and preparation. Scientists have warned of the threat of a global pandemic for many years (Henig, 2020), but higher education failed to prepare for these realities and implications because of the forgotten history of the 1918 Spanish flu pandemic and failure of H1N1, Ebola, and Zika to disrupt higher education. Thus unprepared for the COVID-19 pandemic, many in higher education scrambled to move instruction online, modify campus environments, and slash budgets to offset losses in tuition revenue (Stern, 2020).

Fluctuating trends in globalization and nationalist movements in the 21st century require institutions to develop enrollment strategies that are resilient and adaptable to shifting policies which can expand and contract the pool of recruitable students over time (Alexander, 2020). For-profit education emerged and faded as a challenge to the U.S. higher education system in the last several decades; for-profit credentialing providers have since taken their place as a trend and challenger in the current landscape of continuing education providers (Alexander, 2020). As a result, traditional colleges and universities are under pressure to demonstrate return on investment in an increasingly competitive market (Alexander, 2020). The effects of 2008 Great Recession coupled with (a) upper-level administrative staff bloat, (b) the demand for additional student support services, (c) federal and state budget cuts to subsidies, (d) the rising cost of tuition, and (e) ballooning of student debt have created a financial crisis within higher education that is both real and somewhat perceived (Alexander, 2020; Ambrose & Wankel, 2020; Crow & Dabars, 2015).

Few institutions are in danger of closing or needing bailouts like Sweet Briar College or South Carolina State University (Lindsay, 2018; Schallhorn, 2014); but small-private and minority-serving institutions are some of the most financially vulnerable institutions (Mello, 2020; St. Amour, 2020). Both smaller private institutions and state-systems have pursued mergers and consolidation strategies to address their financial and enrollment challenges (Gardner, 2017; McKenzie, 2021; Nietzel, 2021). While large endowments, scholarship programs, and research grants provide financial stability for medium and large public and private institutions, these institutions are not immune from the confidence crisis that currently plagues much of higher education.

Public confidence in the value of higher education continues to waiver in light of the rising cost of tuition, perceived disconnect between industry and academia, and creation high-paying skill-based jobs that do not require a four-year degree (Alexander, 2020). These current trends and recent events could lead to a spectrum of outcomes – spanning from a complete defunding of higher education by state governments to federal mandates guaranteeing free-college tuition for a wide swath of U.S. citizens. Leaders in higher education cannot prepare for every unanticipated outcome and possibility – but it is irresponsible to not prepare for the anticipated and forecasted realities beyond today as we look towards 2050.

Research Questions and Methods

Based on existing literature and forecasts, outlined in subsequent sections of this chapter, I believe there are at least three realities that are common to all future possibilities for U.S. land-grant universities including (a) identifying alternative sources of revenue, (b) supporting professionals through graduate and continuing education, and (c) maintaining a high level of research productivity. I pose the following research questions to address these realities. The answers to which will contribute to the body of research and inform educational policy and practice.

1. How are University Industry Partnerships (UIPs) structured?
2. What UIP organizational structures and strategies are associated with positive outcomes?
3. How do institutional policies influence research productivity at Clemson University, a land-grant R1 Carnegie Classified institution?
4. To what extent does sense of belonging (SB) matter for part-time graduate students?

5. What outcomes are associated with sense of belonging for part-time graduate students?

The future of higher education presents diverse and complex challenges, which in turn require the use of multiple research methodologies. To address the research questions outlined above, I draw upon both qualitative and quantitative research methods. I use a systematic literature review in Chapter Two to understand how effective university-industry partnerships are structured and respond to research questions one and two. I chose this methodological approach because there is a robust body of literature related to individual UIPs, but a lack of research synthesizing findings. In Chapter Three I use a hermeneutical interpretative policy analysis to investigate how policies and practice influence research productivity at land-grant institutions and address research question three. I selected this methodological approach because there is a lack of research on this topic, and because a policy analysis can generate understanding to guide additional research with larger sample populations or through a quantitative factor analysis. Finally in Chapter Four I aim to answer research questions four and five though a quantitative survey-based study. I selected this approach to apply existing sense-of-belong frameworks to a new population of students – part-time professional graduate students.

Research Paradigms and Theoretical Frameworks

Constructivist Perspective

As a researcher I approach problems with a constructivist orientation. In alignment with constructivist principles, I believe we reach understanding through the collection of data and subjective participant experiences. Constructivists believe that we construct meaning and understanding through reflection and the collection of social and historical experiences (Creswell, 2014). As a researcher I am influenced by the writings of Thomas Kuhn (1962) who

defined constructivism by highlighting how scientific communities collectively construct knowledge, Jean Piaget (1980) who described how observations are structured to create meaning, and John Dewey (1960) who emphasized the role of participation and action in the construction of meaning. As a researcher I ask open-ended and broad research questions and use diverse research methods to construct meaning through academic research. I also select research designs which embody this perspective through their use of pragmatic research methods and their attempt to answer broad research questions with real world applications.

Pragmatic Approach

As a practitioner-scholar in higher education, I adopt a philosophically pragmatic approach to my research. Practionar-scholars are drawn to pragmatism and mixed-methods because their research is driven out of practice-based research questions (Lochmiller & Lester, 2017). Pragmatism emphasizes applications and solutions, allows space for a variety of research methods, and originates from the identification of a specific problem – rather than research questions of a more fundamental nature (Creswell, 2014). My research problem – preparing for the future of higher education – is pragmatic in that it seeks to address a clearly defined problem by exploring multiple solutions. I also incorporate a pragmatic philosophy into my research design through the use of quantitative and qualitative research methods best suited to address my research questions.

Interdisciplinary Theorical Approach

Higher education functions as public-good, an economic engine, and a market-driven industry. While some researchers may emphasize one of these three functions and even disavow others, I believe that these three functions are complimentary rather than conflicting in nature. Embracing the multiple functions and roles of higher education is essential to effectively address

the challenges we face. This important work requires that educational leaders and scholars draw upon the expertise of a variety of disciplines including but not limited to business, economics, engineering, education, and the humanities. To harness the expertise of multiple disciplines I draw upon theoretical frameworks from the fields of learning sciences, leadership studies, education, and economics.

Learning & Educational Theories

I use new and emerging learning theories and educational frameworks to explore SB for part-time professional students. I draw upon Malcom Knowles (1977) foundational theory of andragogy along with the more recent scholarship of Hagen and Park (2016) and Cercone (2008) to understand the needs of adult learners. I also build upon the growing body of research on SB which examines many student populations including online adult learners (Diep et al., 2017), adult undergraduate students (Giacalone, 2020), racial minorities (Duenas & Gloria, 2017), and LGBTQ students (Vaccaro & Newman, 2017).

Leadership & Economic Theories

I rely on theories of organizational leadership and economics to understand how institutions of higher education function both internally and externally to engage with industry and promote research. General Systems Theory (GST) which emerged in the 1950s underscores the interconnectedness and interrelated nature of systems (Schneider & Somers, 2006). Researchers have reexamined and expanded upon GST over time, and this research laid the groundwork for our understanding of how organizations function as systems. In the 1980s Complexity Theory emerged and offered Complex Adaptive Systems (CAS) as a framework to understand organizations that are complex and chaotic (Schneider & Somers, 2006). In CAS leadership and decision-making responsibilities are distributed across the organization (Ambrose

& Wankel, 2020). Since its emergence in the field of leadership studies many within higher education continue to draw upon this framework including Ambrose and Wankel (2020) who say of higher education:

> "We seem to exhibit the characteristics of a complex adaptive system as colleges and universities are made up of many diverse and somewhat autonomous components that are interrelated and interdependent, linked through many interconnections and yet behave as a unified whole. Additionally, universities are dynamic systems that can evolve, adapt, and adjust to environmental changes" (p. 257).

The system of U.S. higher education includes of many institutional types and models. Complexity Theory does not assume that all organizations contain equal amounts of complexity and chaos, but even small private colleges are inherently complex because of the fundamental decentralization of power and decision making within the American university model.

Large research universities are most easily characterized as CAS because of their complex organizational structures, decentralized decision-making, and autonomous yet synergistic units (Owen-Smith, 2018). Labaree (2017), a historian of higher education, claimed that "anarchic complexity" is key to the effectiveness of the university model (p. 193). Some critics and scholars call for even greater complexity among university organizational models. Crow and Dabars (2015) described their model for a "New American University" as a "recasting of the American research university as a complex and adaptive comprehensive knowledge enterprise" (p. 19). They suggested that the organizational frameworks of universities have not evolved effectively to embrace and manage complexity and argued for a transformative redesign of the university model to secure the future of the research university.

Together the concepts of CAS and GST help scholars and leaders understand how decision making in enrollment and admissions, instruction, capital projects, and research are all interconnected. For example, an institution which decides to increase enrollment in graduate programs must prepare departments for the increased course load, ensure proper facilities are available for teaching and research labs, and secure funding for graduate research assistants. These actions require the coordinated involvement of multiple departments and units across the institution – if one piece of the interconnected plan is missing the institution will ultimately fail to achieve its goal.

Economic Theories

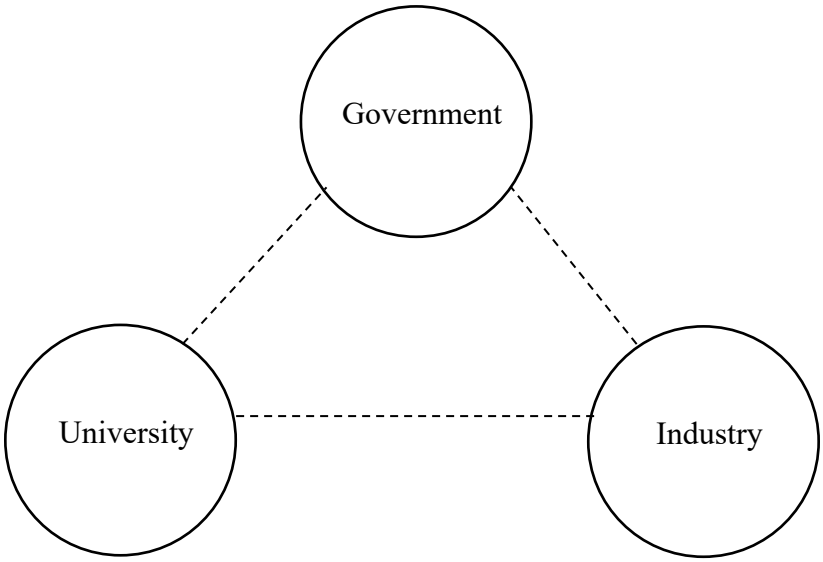
Universities who are entrepreneurial and or use a business model approach have faced criticism (Labaree, 2017; Owen-Smith, 2018). The effectiveness and long-term success of entrepreneurially orientated universities and their business models remains debatable (Etzkowitz, 2016; Klofsten et al., 2019), but the role of universities and colleges as economic engines is difficult to dispute (Etzkowitz & Zhou, 2018). Regardless of the institutional size, type, or mission – all institutions of higher education support local, state, and national workforces to some degree and support local, regional, and state economics as knowledge hubs (Etzkowitz & Zhou, 2018; Owen-Smith, 2020).

Henry Etzkowitz developed and popularized the Triple Helix Model which explains the interactions between industry, university, and government to support innovation and knowledge transfer (Etzkowitz & Zhou, 2018). According to Etzkowitz's Google Scholar profile, he has more than 50,000 citations for his economic theory and his research on university, industry, and government collaboration. In their 2018 book *The Triple Helix*, Etzkowitz and Zhou (2018) drew upon countless examples of institutions, federal policies, regional development efforts, and

industry investments to illustrate the dynamic that drives innovation when industry, academia, and government converge in the same physical and intellectual space. Their theoretical model endorses an investment in university-industry partnerships – but also illustrates how these three sectors are strengthened through collaboration. Figure 2 reflects Etzkowitz and Zhou's (2018) articulation of the Triple Helix within laissez-faire economic environments. The model and interactions between the three entities differs in both socialist and autocratic political environments. I adopt and employ this model configuration, which reflects the theoretical model within democratic governments and capitalist economies – the setting and sample data for my study in Chapter Two.

Figure 2

Triple Helix Model (Etzkowitz & Zhou, 2018)



The Transformation of U.S. Higher Education

Major historical events that transformed the landscape of higher education

Alexander (2020) argued that we cannot understand the future of landscape of higher education if we do not understand our history and "what will persist from our present and our

past" (p.16). A comprehensive look at how to prepare for the future of higher education begins with understanding the challenges and transformations of our past and present – which will continue to influence the future (Ambrose & Wankel, 2020). Understanding the legacy and history of U.S. higher education is also important because evidence suggests that higher education is on a trajectory to return to models and practices common before the 1940s (Labaree, 2017). Some predictable events which transformed higher education in the past include the GI Bill, desegregation, and the impact of the Cold War. Other less predictable but equally transformative events include World War II, the 2008 Financial Crisis and the COVID-19 pandemic.

An examination of the past and future must also account for the both the anticipated and less predictable events which will define the future of our profession. Historians of higher education structure and craft their narratives in many ways. In my work I use legislation, movements, and trends at the federal level as a framework to understand social, political, and cultural movements. Federal policy is not solely responsible for creating change within higher education and is generally a marker of larger social and cultural shifts. A common thread ties together each piece of federal legislation, court ruling, and policy directed at higher education – the purpose of higher education to produce an educated citizenry for a democratic society (Ambrose & Wankel, 2020). The policies and practices subsequently described expanded access to higher education and produced a more educated citizenry to participate in U.S. democracy.

The democratic ideals of higher education have not historically led to access or equitable opportunities for advancement through education for all Americans. Historians have rarely acknowledged the negative consequences and inequities of policies when considering the legacies of the Land Grant Acts, the GI Bill, Brown v. Board of Education, and U.S. armed

conflicts. Critical Race Theories (Ladson-Billings, 1998) however help us understand how some of these landmark achievements fail to provide the same benefits and opportunities for marginalized populations in the U.S including: African Americans (Lopez & Burciaga, 2014), Latinx (Villalpando, 2004) Native Americans (Brayboy, 2006), and Asian Americans (Museus & Iftikar, 2013). Despite providing unequitable opportunities for all citizens – the subsequently described events transformed U.S. higher education in profound and lasting ways.

Land Grant Acts and Hatch Act

Labaree (2017) argued that The Morrill Act of 1862 was the first step forward in the transformation of U.S. higher education from its fragmented colonial roots to a diverse and chaotic national system. Abraham Lincoln signed the first Morrill Act in 1862 during the Civil War (Geiger, 2016). This piece of legislation promised 30,000 acres of federal land, or the proceeds from which, for each state representative and senator in the U.S. Congress to state who agreed to the terms (Geiger, 2016, p. 281). The most historically important legislative clause included the establishment of at least one college "in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life" (Gavazzi & Gee, 2018, p. 37).

U.S. Higher education slowly expanded after Congress approved the Morrill Act of 1862, hampered by the ongoing Civil War. However, after the Civil War the addition of eligible Southern states and post-war climate supported a growth in college enrollment and states across the Union took advantage of Morrill Act benefits (Geiger, 2016). In 1890, the U.S. Congress passed a second Morrill Act which provided additional funding for land-grant institutions and established 17 land-grants institutions to serve African American students exclusively (Gavazzi & Gee, 2018). The 1890 Morrill Act attempted to ban racial discrimination among institutions

who received funding, however states who established what we now call Historically Black Colleges and Universities (HBCUs) avoided integration of higher education while remaining eligible for federal funding (National Research Council, 1995).

The Hatch Act of 1887, Smith-Lever Act of 1914, and introduction of a new university model with the establishment of John Hopkins University complemented the climate created by the Morrill Acts of 1862 and 1890. Legislators appropriated funds for the establishment of experimental stations through The Hatch Act, which Gavazzi and Gee (2018) characterized as the beginning stage in the evolution of American research university. Congress established the Cooperative Extension Service through The Smith-Lever Act of 1914, which created a system through which institutional research and learning could reach local communities (Gavazzi & Gee, 2018). The founders of John Hopkins University in 1876 unknowingly created the model for the American research university when they combined the models of both Oxford and the University of Berlin. Up until this time, new U.S. colleges and universities adopted on the Oxford model, which emphasized undergraduate education in the liberal arts (Owen-Smith, 2018). The University of Berlin model for higher education introduced graduate education, advanced degrees, and student-supported research to the U.S. higher education enterprise (Crow & Dabars, 2015). The success of John Hopkins University and new public and private institutions during this era complimented the utilitarian goals of the Morrill, Smith-Lever, and Hatch Acts to guide the development of a new institutional model many land-grant colleges would adopt – the American research university (Crow & Dabars, 2015).

Ambrose and Wankel (2020) retrospectively viewed the legacy of the Morrill Acts as a recognition of the role higher education would play in addressing the challenges presented by a changing world. A desire to strengthen the perceived power of the Union at the outset of the U.S

Civil War, a historical divestment in the ownership and management of federal lands, and the need to expand higher education for a growing nation and industrialized economy each drove the passage of The Morrill Act of 1862. The diversity of drivers behind the legislation did not negate the stated goals to (a) provide federal funding for state governed higher education and (b) support agricultural and industrial development. In response to the success of the land-grant model, U.S. Congress passed similar legislation in the 1960s and 1970s. Finally in 1994 Congress passed a third Morrill Act establishing tribal colleges and universities for Native Americans (Gavazzi & Gee, 2018, p. 39). Today the legacy of the Morrill Acts is clear, land-grant institutions award close to 1.2 million undergraduate degrees annually and approximately 70% of current U.S. graduate students attend a land-grant institution (Gavazzi & Gee, 2018). Since 1862, land-grant institutions have grown from start-up colleges to become the backbone of U.S. higher education. This critical legislation and capacity building in higher education supported the incredible growth and rise of the U.S. as a national power in the twentieth century.

1944 GI Bill

Politicians promoted The Servicemen's Readjustment Act of 1944, more commonly referred to as the GI Bill, as legislation which would produce political, social, and economic benefits to the nation (Ambrose & Wankel, 2020). The 1944 GI Bill, which included other benefits for veterans apart from financial support for education, represented a national investment in higher education at the peak of U.S. federal investment in higher education (Labaree, 2017). Like the Morrill Acts which proceeded it – several factors beyond promoting an educated citizenry for a democratic society motivated the drafting and approval of the GI Bill. The GI Bill also helped the U.S. economy absorb the influx of 15 million servicemen and women who served in the war; routing veterans to colleges, universities, and training programs

prevented massive unemployment and created a stockpile of human and economic capital at a time when most international economies recovered from World War II (Labaree, 2017).

The years after World War II and through the 1970s were a period of historically low-income inequality in the U.S. (Alexander, 2020). Veterans sparked a boom in college enrollment as they returned from war and used GI Bill benefits to pursue an education, purchases homes, and or start businesses (Mencke, 2010). Both U.S. higher education and the American middle class experienced a boom post-World War II through the combination of low-income inequality, increased enrollment in higher education, and continued federal investment in university research related to the Cold War (Owen-Smith, 2018).

Because higher education remained segregated and African Americans couldn't obtain FHA-backed mortgages until the late 1960s (Rothstein, 2017) – The GI Bill largely benefited only White American GIs and their families. As a result, The GI Bill expanded access to higher education for White Americans and generated the financial and social capital that would drive their families into the middle class and back to universities in the 1970s. Meanwhile African American GIs could not (a) enroll at white-only institutions, (b) secure mortgages, (c) join workers unions, or (d) secure the high-paying jobs available to White veterans (Mencke, 2010; Rothstein, 2017).

Eventually some two million veterans used the GI Bill of 1944 to obtain some form of higher education; these veterans contributed to record enrollment in 1948 when U.S. college student enrolled exceeded pre-war totals by more than one million (Labaree, 2017). Following this wave of enrollment and growth within higher education the Truman administration commissioned a report which laid out national goals for higher education including our modern financial-aid system and a model for investments in higher education by the federal government

(Owen-Smith, 2018). 1958 National Defense Education Act included many of the reforms and recommendations put forth by this commission as the space race with the U.S.S.R. accelerated and Cold War continued (Owen-Smith, 2018).

The Cold War & The Golden Age

The events between 1947 and the fall of the Berlin Wall in 1989, generally labeled as The Cold War, transformed U.S. higher education. The following events occurred amidst the backdrop of The Cold War, and while not always interpretated in relation to this conflict – collectively they help us understand how federal policies and U.S. armed conflicts continued to transform higher education from the passing of the first Morrill Act in 1862 to the fall of the Berlin wall in 1989.

Desegregation of Higher Education. The civil rights movement in the U.S. occurred alongside the backdrop of the Cold War; history and Critical Race Theory help us to understand the intertwinement of these two movements. Interest convergence, a principle of Critical Race Theory, helps explain how U.S. federal policies to promote desegregation and ban discrimination moved forward in part to protect the image of democracy against the rise of communist threats abroad (Delgado & Stefancic, 2011). The U.S. Supreme Court issued its landmark ruling on Brown v. Board of Education in 1954 which set in motion the desegregation of primary and secondary schools (Lopez & Burciaga, 2014). U.S. courts heard many legal challenges to segregationist education policies, the 1954 Brown v. Board of Education Supreme Court case the most notable among them. Two years later, Florida ex rel Hawkins v. Board of Control established the legal precedent for the desegregation of higher education in 1956 (Brown, 2004). Neither educators nor government officials adequately enforced these legal precedents, which led

to and necessitated the passage of the Civil Rights Act of 1964 to further eliminate racially discriminatory practices (Brown, 2004).

In the years after Brown v. Board, local school districts found judicial loopholes and used strategies like zoning laws to keep primary and secondary schools segregated for the most part (Rothstein, 2017). Despite the Brown v. Board ruling, many African American students remained in poorly funded schools with little racial integration for decades. Meanwhile colleges and university leaders, particularly across the south, initially ignored federal rulings and fought the enrollment of African American students with both legal tactics and physical violence (Wainscott, 1988; Brown, 2004). These efforts delayed equitable access to higher education for African Americans for nearly another generation. HBCUs also struggled in the wake of Brown v. Board as their students increasingly enrolled at formerly segregated state colleges and universities (U.S. Department of Education, Office of Civil Rights, 1991).

Together court rulings, legislation, and policies initiated the ongoing desegregation of U.S. higher education; thus, measuring the impact of desegregation in numerical terms is difficult. According to The U.S. Department of Education, National Center for Educational Statistics (2019), the number of African American students enrolled in higher education increased from 10% of total enrollment in 1976 to a record high of 15% in 2011. HBCUs also saw growth in enrollments during this same period but have seen declines in enrollment since 2010 (National Center for Educational Statistics, 2019). According to the U.S. Census Bureau (1999), the percent of African Americans who had completed 4 or more years of college increased from 3.1% in 1960 to 14.7% in 1998. Despite progress and fluctuations in statistics related to access and enrollment of African Americans in higher education, the lasting impact of segregationist policies lives on.

Racial segregation is on the rise in U.S. higher education, despite the desegregation movement of the 1960s and gains in African American enrollment, because of the persistence of institutionalized racism, accelerating income inequality, and educational inequality (Alexander, 2020). More than 50 years after the start of desegregation within U.S. higher education, access and equity for racially minoritized groups continues as a challenge and priority. The full impact of desegregation on higher education is complex and still unfolding. What is clear however, is desegregation forced the system to reckon with racial, gender, sexual, and other forms of diversity over the last 50 years in ways unimaginable in the 1950s and 1960s.

The Return of the Draft. The Vietnam and Korean Wars required U.S. leaders to reinstate the military draft, which transformed higher education for the second time in a century. While the draft served wartime efforts, it also increased the value of an undergraduate degree, promoted the expansion of graduate programs, and created incentive to teach or engage in wartime research efforts as all qualified as service exemptions (Labaree, 2017). The draft and lottery system used in 1969 continued to honor deferments and exemptions for eligible or drafted men until the draft effectively ended in 1972 (Card & Lemieux, 2001). While desegregation efforts increased access for African Americans to higher education, the military draft created additional incentive for all American men to consider a college education. The military draft coupled with other factors in the 1960s and 1970s set the stage for an enrollment boom in the 1980s and 1990s.

The Higher Education Act of 1965. President Johnson signed The Higher Education Act of 1965 into law which included funding for need-based grants, established the federal work-study program, and created a federal student loan program (Hegji, 2016). These programs increased access to higher education for America's poor and working classes. In 2015-2016,

55% of all undergraduates received some form of federal aid, 5% of undergraduate students participated in the federal work-study program, and 38% of students benefited from need-based federal grants (Radwin et al., 2018). The U.S. Congress reauthorized The Higher Education Act of 1965 multiple times to continue to expand and reform federal funding for student tuition (Flannery, 2015). College enrollment grew during the Cold War era in large part because The Civil Rights Act of 1964 increased access to higher education for African Americans, the return of the draft created additional incentive to pursue higher education, and The Higher Education Act of 1965 increased federal funding for higher education.

The Space Race and the Rise of STEM in Higher Education. Historians credit the space race between the U.S. and the U.S.S.R. for the growth of STEM disciplines and research in higher education. Between 1946 and 1950, the peak of World War II GI enrollment, 11.3% of awarded bachelor's degrees were in engineering fields (Abt Associates Inc., 2004). Engineering's share of awarded bachelor's degree fell below 6% in 1971 when the space race with the U.S.S.R. cooled (Abt Associates Inc., 2004). During this same period, The National Defense Education Act of 1958 drove curriculum reforms and promoted STEM fields in the name of national security (Owen-Smith, 2018). Research in STEM fields continued to expand during the Cold War years building on the research capacity and infrastructure developed during World War II. Vannevar Bush's 1945 report *Science the Endless Frontier* laid the groundwork for national infrastructure to fund scientific research and the establishment of the National Science Foundation (Owen-Smith, 2018). The strength of STEM academic departments and the National Science Foundation are both products of the space race and Cold War era federal investments in higher education.

Enrollment Boom of the 1980s and 1990s. College enrollment reached record high levels during the 1980s and 1990s because of both population growth and some of the events described above which increased access to higher education. U.S. undergraduate enrollment increased by 47% between 1970 and 1983, continuing to rise by another 18% before leveling off in the mid-1990s (Alexander, 2020). This growth in enrollment resulted in the expansion and growth of facilities and infrastructure across the higher education system. A bust inevitably follows every boom and universities have adapted as the rate of growth for college student enrollment slowed and leveled off beginning the 1990s. Some historians considered this enrollment boom to mark the end of the Golden Age of higher education (Labaree, 2017). Historians remember this period of history for the incredible growth in enrollment, access, and research productivity within higher education. But a closer examination reveals turbulence and uncertainty during the Cold War years for both the U.S. and higher education. The U.S. higher education system effectively navigated this period in history and thrived by adapting and changing – at times slowly and other points seemingly overnight.

Current and Recent Transformations of Higher Education

An examination of both the history and current trends in U.S. higher education reveals a system in a constant state of evolution despite its relative stability. The system's ability to adapt, change, and evolve creates a perception of stability in a complex and chaotic system under constant tension. In the last two decades the emergence of technology-centered education, swinging globalization movements, competition with for-profit education providers, the 2008 Great Recession, a confidence crisis, and the COVID-19 pandemic have each transformed and continue to impact higher education.

Emergence of Technology-Centered Education

In her book *The New Education*, Davidson (2017) described a tension in higher education between a technophobia and technophilia – a fear of and obsession with technology respectively. Instructors hesitate to adopt emerging technologies, and the failure of MOOCs to live up to their initial promise continue to reinforce that apprehension (Alexander, 2020). Despite the failure of educators to widely adopt some technologies – the internet, learning management systems (LMSs), and the growth of online programs place technology at the center of learning in higher education. Developers transformed existing LMS technology from the 1920s into their current forms during the 1990s and 2000s with the invention of the internet and cloud-based storage solutions (Gilbert, n.d.).

In 2018, 3.3 million students in the U.S. enrolled in at least one online course (U.S. News, n.d.). In 2020, an estimated 19.7 million students enrolled in U.S. higher education and relied on LMS technology and online learning to continue their studies during the COVID-19 pandemic (National Center for Education Statistics, 2019). The slow emergence of technology-centered education which began in the 1990s helped institutions increase enrollment and improve instruction. The continued reliance on online learning during the COVID-19 pandemic may have solidified the role of technology in education for at least another generation. Students may no longer expect technology to supplement their learning – they will instead expect technology to facilitate, enhance, and tailor their learning experience as technologies such as artificial intelligence are increasingly adapted for educational settings.

Swinging Tides of Internationalization and Nationalist Movements

American institutions responded to intense globalization trends in the 1990s and early 2000s by opening hundreds international branch campuses around the globe (Lane, 2011).

Increased competition and nationalist political movements across the globe however placed pressure on these branch campuses and institutions. China has invested hundreds of billions of dollars into higher education in recent decades to increase their own national capacities for education and research (Pant & Khan, 2020). Through this investment, the Chinese government built internationally recognized research universities based on the American model from scratch in a matter of decades (Crow & Dabars, 2015). Since 2001 increased demand and population growth in India has led to the rapid expansion of the Indian higher education system. Despite challenges for graduates to find employment and criticisms of poor teaching quality, enrollment in Indian universities has increased 400% since 2001 (Ravi et al., 2019).

As other nations improve their educational infrastructure fewer international students may look to the U.S. for higher education; the peak of international enrollees at U.S. institutions may have arrived (Alexander, 2020; Ambrose & Wankel, 2020). At the very least, the international market may shift to target students in other developing countries. How the Trump administration's immigration policies and the COVID-19 pandemic travel restrictions impacted higher education in the long term is still unknown (Ambrose & Wankel, 2020), but both events have highlighted the potential threat of an over-reliance on international students to bolster tuition revenue at U.S. institutions.

Competition with for-profit education providers

For-profit providers ability to tap into an underserved market – students of color and veterans – drove the for-profit-education boom of the 1990s and 2000s (Angulo, 2016). The first wave of for-profit education providers may have reached its market saturation and failed to provide the disruption many predicted. More recently, a second wave of for-profit educational providers has emerged in the marketplace offering alternative forms of certification in the form

of credentials, badges, and professional certifications. Ambrose and Wankel (2020) described this second wave as "the rise of the shadow learning economy" (p. 29). An environment where professionals seek continuing educational in the form of short experiences like bootcamps, online classes, and certificates. With the option to pursue less-expensive skill-based programs which provide pathways to high-paying jobs, many high school graduates and working professionals may continue to turn to for-profit educational providers in this second-wave. In response to the first wave of this movement, non-profit institutions expanded support services for students for-profit institutions attracted including adult learners, veterans, and students of color. Non-profit institutions must now consider how they can support life-long learning outside of formal and expensive graduate degree program in response to this movement and demand for credentialling.

The COVID-19 Pandemic

Higher education has navigated pandemics before, though the scale and scope of the COVID-19 pandemic's impact on higher education remains unclear. The Spanish flu pandemic of 1918 is perhaps the best historical reference to help us understand how the COVID-19 pandemic will impact higher education in the long run. Stout (2020) credited the Spanish flu for the establishment of student health services at Penn State University. At the University of North Carolina – Chapel Hill, the Spanish flu resulted in the quarantining of the campus and the deaths of both the university president and his interim replacement (Cozens, 2020). Finally, at Harvard University administrators implemented a number of practices that we would recognize today as social-distancing in order to stay open and reduce infections – while the virus spread through Cambridge and Boston (Wong, 2020). These three examples illustrate how the Spanish flu

pandemic led institutions of higher education to invest in student health centers, created changes in university leadership, and laid the groundwork for modern crisis response plans and protocols.

COVID-19 is not the only virus to require engagement and response from the university research enterprise. The COVID-19 pandemic will likely have long term impacts for higher education. Historical trends suggest that the pandemic may drive a shift in research towards the bio-medical field, the further expansion of STEM academic programs, and a reexamination of the role that technology can and should play in instruction and learning. The lessons learned from the both the Spanish flu and COVID-19 pandemics should inform our decision making to better prepare for and anticipate similar events in the future.

Financial Crisis

The COVID-19 pandemic intensified the financial strain that many institutions of higher education have felt since the 2008 Great Recession. State funding for U.S. higher education has progressively declined since 2001 (Crow & Dabars, 2015; Owen-Smith, 2018). Economist Robert Gordon (2014) estimated that between 2001 and 2012 state and municipal funding for higher education declined by one-third, when adjusted for inflation. Since the 2008 Great Recession, austerity measures and defunding trends have accelerated and federal budget proposals under the Trump administration included drastic cuts (Owen-Smith, 2018). These funding cuts forced many institutions to raise student tuition, which contributed further to the ballooning of college student debt. This trend is unlikely to reverse, the most realistic optimal outcome is a slight increase in federal funding for higher education to maintain the status quo. Regardless of future possibilities, Alexander (2020) argued that institutions must look for alternative sources of funding in the future "if income and wealth inequality continues rising… while institutional operational costs remain high or also rise" (p. 131).

Confidence Crisis

The ballooning of college student debt in the U.S. feed a second crisis – a crisis of confidence in the value of the traditional college degree and experience. Universities are under pressure to abandon liberal art degrees in response to public concern over the misalignment between workforce needs and university curriculums– despite evidence that these degrees instill the non-technical skills that employers are looking for (Ambrose & Wankel, 2020). Owen-Smith (2008) argued that universities are out of touch with real world problems in the sense that many traditional academic programs and institutional missions are not directly tied to current challenges and applications. Gavazzi and Gee (2018) suggested that public confidence in the value of a college degree and its cost has declined while universities invested in themselves (through capital projects, endowments, and campus amenities) rather than their communities. The way out of this crisis is not to defend our ivory towers but rather leave the protective bubble of college campuses to engage with industry, modify curriculums to reflect industry needs, reduce the cost of obtaining a degree, and clearly demonstrate the return-on-investment students can expect both quantitatively and qualitatively.

Connections to Research Questions

Why will university-industry partnerships matter?

University-Industry Partnerships (UIPs) are mechanisms capable of helping higher education respond to both the confidence crisis and the financial crisis. When effectively structured UIPs help institutions (a) address workforce skill gaps, (b) serve as an alternative revenue model, (c) support applied research, and (d) strengthen the connection between universities and their communities.

Workforce Skill-Gaps

Historically, advances in technology create more jobs than they eliminate. As the rate of advancement and adoption of technology increases, it is essential for higher education to partner closely with industry to help workers upskill into new occupations (Ambrose & Wankel, 2020). Partnerships between industry and universities, including collaboration on curriculum development and training, are one way to address the short-shelf-life of technical knowledge and skills (Ambrose & Wankel, 2020). These partnerships can inform the development of workforce training and continuing education programs, as well as modifications to undergraduate academic curriculums. An increased and public pursuit of UIPs on the part of universities is one strategy to address the public confidence crisis growing in U.S. higher education. As one example of the potential for UIPs to meet industry needs, Lutte and Mills (2019) examined a partnership between the airline industry and higher education and found such partnerships gave students a direct path to employment, provided universities with financial support, and filled an industry need.

Revenue Source

UIPs also offer an alternative source of revenue to subsidize infrastructure costs, establish endowments, fund student programs, and support research efforts depending on their scale and structure. In a study of land-grant university senior administrators Gavazzi and Gee (2018) highlighted the need to develop alternative revenue models and cited donor relations and UIPs as practices used by institutions to offset declines in government subsidies and tuition revenue. Despite declines, the National Science Foundation (2018) reported that federal funding remained the primary source of research and development (R&D) funding in higher education. At Carnegie Classified R1 land-grant universities in FY 2018, states funded nearly twice the amount

of R&D compared to business and industry (National Science Foundation, 2018). This funding model reflects historical trends, but also highlights an opportunity for institutions looking to supplement research funding as state and federal investments stagnate. The promise of UIPs as revenue source for universities supports a business case for forging partnerships with industry; the potential of these partnerships to support and expand research efforts supports an intellectual case for pursuing UIPs.

Support for Research

As public funding for research continues to decline, universities may find UIPs useful as alternative sources of funding for fundamental and applied research. UIPs are natural avenues to support applied research which leads to technology transfer, immediate application, and return-on-investment. Limited financial incentives make industry stakeholders less likely to support fundamental research through UIPs. Yet scholars and economist recognize the economic impact and potential for both fundamental and applied research. Additionally, R&D units at universities develop many of the products, services, and processes we rely on daily (Crow & Dabars, 2015).

UIPs are an especially attractive avenue to support research at land-grant universities because of the land-grant charge to pursue applied research (Gavazzi & Gee, 2018). Etzkowitz and Zhou (2018) illustrated how early UIPs from the World War II era were driven by a desire to promote the public good and support wartime efforts, while more modern entrepreneurial UIPs are motivated by technology transfer, return-on-investment, or access to resources. Owen-Smith (2018) cautioned against the pursuit of such partnerships for the sole purpose of funding research. Because of these self-interested motivations, university administrators must evaluate the motivating factors for each party in such partnerships to ensure that private returns do not outweigh the potential for public good. Despite this motivational conflict – interaction with

industry can improve the applicability of research. The volume of irrelevant or unapplicable research is a concern. Some estimates have suggested that anywhere between 60-77% of peer-reviewed journal articles go uncited within the first 5 years of publication (Baker, 2018; Bauerlein, 2010). Partnerships between industry and university researchers can ensure university research is relevant, applied, and most importantly read.

Community Connections

The connections between institutions of higher education and their communities differ largely based on institutional type and missions. Large public research universities are economic engines for their regions (Owen-Smith, 2018); whereas land-grant institutions are connected to their states through their missions and agricultural extension services (Gavazzi & Gee, 2018); while economic conditions and local job market demands support enrollment at 2-year institutions (Grawe, 2021). Industries, regions, and communities are also more resilient when they are connected to universities. Owen-Smith (2018) described this relationship using the metaphor of universities as anchors for communities in the same way that department stores anchor shopping malls. BMW Group's presence in South Carolina illustrates the anchoring effect between industry and academia. During the nearly three decades since it opened its first U.S. manufacturing plant BMW Group (n.d.) established partnerships in the surrounding counties with local community colleges (Greenville Technical College, n.d.), locally based for-profit educational providers (ECPI University, n.d.), regional public institutions (USC Upstate, 2010), and a large land-grant institution (Browning, 2006). This collaboration with local educational institutions demonstrates how UIPs with large companies function as economic and intellectual anchors for a community.

Why will maintaining and expanding research capacity at land-grant institutions matter?

Rhodes (2001) described the American research university as a "catalyst in modern society, the factor essential to its effective functioning and well-being" (p. xi). Land-grant universities played a crucial role in the creation of that catalyst as six of fifteen institutions credited with consolidating the structure and forming the model of the American research university are land-grant institutions (Geiger, 1986). As part of their core mission, land-grant research universities promote knowledge transfer through education, research, and service to the state (Association of Public & Land-Grant Universities, n.d.). Academic research is generally labeled as either basic or applied, and by nature of the land-grant mission research conducted at those institutions is more applied in nature. Applied research with direct applications to industry and practices honors all three tenants of the land-grant university mission – teaching, research, and service – in that it supports all three (Gavazzi & Gee, 2018).

In 2020, 40 land-grant institutions in the U.S. earned the highest-level designation for research activity – R1 (Carnegie Classification of Institutions of Higher Education, 2020). There are only 93 public research universities who earned this classification in 2020, and land-grant institutions made up nearly half of them. This study defines research-intensive land-grant universities, as doctoral land-grant universities who earn the Carnegie R1 classification (Carnegie Classification of Institutions of Higher Education, 2020). Because R1 land-grant universities represent approximately 43% of public R1 institutions, understanding how they promote high levels of research productivity is essential in the effort to sustain and expand research capacity at public universities. According to the National Science Foundation (2018), R1 land-grant universities reported $17,951,368,000 billon in R&D expenditures in FY 2018; land grant institutions, both R1 and non-R1, reported $28,692,044,00 billon in R&D

expenditures in FY 2018. This survey indicates that land grant universities accounted for 36% of R&D expenditures by universities and colleges in FY 2018. R1 land-grant universities, which only included 4% of institutions surveyed, accounted for 22.5% of all R&D expenditures in FY 2018. These statistics are quantitative evidence of the vital role of land-grant institutions in the ecosystem of both higher education and global innovation.

The historical missions and modern legacies of land-grant institutions offer a qualitative rationale for the importance of UIPs. In a study by Gavazzi and Gee (2018), university presidents acknowledged the need to address declines in funding by promoting efficiency and alternative revenue streams. Sponsored research is one of the four major categories of revenue on which universities depend, and university presidents cited research as the greatest strength of land grant institutions. Owen Smith (2018) argued that research universities play an essential role in the U.S. as sources of knowledge, anchors for communities, and as connection hubs. Gavazzi and Gee (2018) expanded on this metaphor in their study *Land-Grant Universities of the Future* as they underscore the foundation of the land-grant mission to serve the state community through instruction and the transfer of research.

Why Will Engaging Professional Part-Time Students Matter?

Academic culture has long prioritized research (Crow & Dabars, 2015), and yet the future of higher education may hinge on the ability of institutions to support part-time students and adult learners. Both researchers and the media continue to examine the number and needs of adult learners in the U.S. who have completed some form of higher education but not earned degrees. Experts have estimated that U.S. adult learners with some college credits but no degree number between 30-35 million or 17% of Americans over the age of 25 (Erisman & Steele, 2015). College graduates in need of continuing education represent a second group of adult

learners who higher education may also serve in greater numbers in the future. Experts in the field project continued growth of professional graduate programs (McKenzie, 2019). Additionally, many college degree holders will also need to up-skill at some point in their careers (Pika & Wynn, 2020; Carneval et al., 2019). Yet there is little research on how to effectively engage part-time professional students who are returning to up-skill or obtain a graduate degree.

MBA programs have entered a period of high competition for students as employer demand for MBA credentials decrease and the number of new programs increase (Edmonds, 2020). In the healthcare field, there are many pathways for professionals to upskill and become RNs, however students pursuing these pathways face financial, logistical, and personal challenges (Ockert, 2019). In STEM fields the number of graduate degrees awarded more than doubled from 2000 to 2017, and statisticians project this growth trend to continue at least through 2028 (National Science Board, 2019).

Many students in the fields above, as well as in education, pursue graduate degrees part-time and work full-time. In 2018 there were 1.3 million part-time post-baccalaureate students in the U.S.; between 2018 and 2029 that number is projected to increase by 4% (Hussar et al., 2020). Existing research on adult learners typically lumps all graduate students into a monolith or focuses on specific academic programs as noted in the examples above. This approach limits the transfer of findings and implications to practice, particularly with part-time professional graduate students. There is a critical need for research on part-time professional graduate students, there needs, motivations, and key strategies for retention.

Between 3-14% of the global workforce will need new occupations or require up-skilling as advances in Artificial Intelligence (AI) make their current roles redundant or their occupational duties are replaced or enhanced by AI (Ambrose & Wankel, 2020). In the future, AI

may impact not only occupational roles, but also workforce training. A LinkedIn Learning (2020) survey found that 41% of respondents believe AI will have the greatest technological impact on training and lead to more personalized learning experiences. More than 40% of companies surveyed also reported plans to launch new internal upskilling and reskilling programs in 2020. HR and industry executives struggle to create effective learning and training experiences for their employees– especially for smaller enterprises with less infrastructure and capacity. Engaging this relatively untapped market of working professionals looking to upskill or obtain a second degree can boost institutional enrollment, offset-funding shortages by creating tuition revenue, and respond to the confidence crisis by meeting industry and learner needs.

Chapter Two:
A Systematic Literature Review to Examine the Structure of UIPs

Introduction

University Industry Partnerships (UIPs) offer a mechanism to address many of the challenges faced by leaders in higher education. The history and legacy of these partnerships is deeper and richer than many practitioners realize. Much remains misunderstood about the value, scope, structure, and outcomes associated with UIPs. This study addresses a gap in existing research and seeks to generate new knowledge related to the best practices for structuring UIPs. This chapter and study also serve as both a thesis literature review and a standalone literature review (Okoli, 2015). To accomplish this goal, I first framed this problem of practice and my research questions within existing research. Second, I conducted a systematic literature review and synthesize findings to inform policy and practice.

Following the guidance of Okoli (2015) this literature review aims to be transparent in both its methods and I the researcher in my motivations for pursuing these research questions. As a researcher I approached this study after working with a UIP for more than four years. This professional experience introduced me to both the opportunities and challenges associated with UIPs. Frustrated by the lack of scholarly research dedicated to the structuring of UIPs I sought to answer the research questions outlined below. I adopted a systematic approach to this literature review to eliminate any bias I as a researcher may bring because of my professional experiences.

Purpose and Research Questions

Within a typical study a literature review guides the construction of research questions, protocols, research design, and scope of the study. When implemented as a research methodology, literature reviews take on a broader and larger purpose. Baumeister and Leary (1997) described five possible goals of literature reviews: (a) theory development, (b) theory evaluation, (c) survey of the state of knowledge, (d) problem identification, and (e) historical

account of theory or topic. This literature review surveys the state of knowledge related to the structure of UIPs. Surveys of the state of knowledge are useful to both scholars and practitioners; their research questions, design methodologies, and dissemination goals are based upon the overarching purpose and aim to provide a useful overview of literature for scholars and practitioners.

This study answers the following research questions by systematically reviewing current literature and practices in UIPs:

1. How are UIP structured?
2. What organizational UIP structures and strategies are most likely to be associated with positive outcomes?

For the purposes of this study, I drew on my own professional experiences with UIPs and define *structure* as mechanisms, strategies, and practices used to organize human resources and facilitate collaboration – including such elements as formal organizational structure, groupings, teams, communication channels, meetings, time spent together. Measuring and reporting on the effectiveness or success of UIPs is a difficult and subjective process (Ankrah & AL-Tabbaa, 2015). Therefore, I avoid such labels and terminology and instead examine the resulting sample of literature for positive outcomes noted by researchers. Positive outcomes may include but are not limited to technology transfer, research funding, and opportunities for university students.

The above research questions require data to be collected across a number of samples to generalize findings. The systematic literature review methodology is ideally suited to answer research questions related to UIP structure and organization because the systematic review process minimizes bias, depends on an existing data set of published literature, and faces none of the challenges presented by the methodological approaches reviewed above. Systematic reviews

allow practitioners to stay up to date on the field of research, are often a starting point for developing guidelines for professional practice and provide policy makers with evidence for decision making (Liberati et al, 2009, Moher et al., 2009). Harden and Thomas (2005) explained how traditionally systematic literature reviews answered epistemologically positivist questions. Researchers framed these studies with research questions that seek to answer questions of effectiveness and thus the reader assumes a positivist approach to research when not outrightly claimed or refuted by the researcher.

I explicitly adopted a constructivist and pragmatic epistemological approach for this systematic literature. My pragmatism drove the selection of the research design and methodology – one that has the greatest potential to inform practice. My constructivist approach, rather than the more traditional positivist approach, drove data analysis and the presentation of findings. The array of practices for structuring UIPs reflect the diversity and complexity of UIPs as a whole. No single structure or set of guidelines will apply universally to all partnerships. Thus, this systematic literature review reflects that diversity in its synthesis of research findings.

Theoretical Framework for UIPs

The Triple Helix model and scholarship of Henry Etzkowitz in particular, provides a foundation for the literature review and methodological decisions in this study. In their book *The Triple Helix,* Etzkowitz and Zhou (2018) provided a detailed history of UIPs along with more current examples which demonstrate the possible configurations of UIPs. With their Triple Helix Model (Figure 2) Etzkowitz and Zhou (2018) presented a broad framework to understand the interactions, outcomes, opportunities, and challenges associated with interactions between industry, academia, and government. In addition to providing context and history for the evolution of industry-university-government collaboration across the globe since the mid-20th

century, Etzkowitz and Zhou (2018) offered tailored models based on political and economic context. The laissez-faire model best captures the conditions present in the U.S., Japan, and Europe – three political and national environments with a well-documented history of UIPs. I base my decision to focus this systematic literature review on UIPs in established democratic and capitalist nations on the Triple Helix laissez-faire model (Etzkowitz & Zhou, 2018).

History of UIPs

The success of UIPs over the last half-century in the U.S., Japan, and Europe led to the pursuit of UIPs worldwide and contributed to the emergence of the entrepreneurial university model. Entrepreneurial universities incorporate the practices of UIPs and adopt a third mission in addition to research and teaching, the generation of revenue from the dissemination of knowledge to society (Nawaz & Koç, 2020). This new institutional model is increasing in popularity in developing nations and those without a rich history of UIPs. The emergence of the entrepreneurial university and strategic pursuit of UIPs is a recent phenomenon in Australia, Southeast Asian nations, South America, and African developing nations. These institutional and UIP models include innovative approaches but are yet in their infancy. This review of UIPs focuses instead on the more than 70-year history of UIPs within the U.S., Japan, and Europe.

The U.S.

Lee (2000) traced the formal collaboration between universities and industry in the U.S. to the Civil War era. However, Etzkowitz and Zhou (2018) traced the roots and legacies of modern UIPs to research collaborations between the U.S. government and university research labs during World War II. Scholars and historians have interpreted the establishment of Bell Labs, Boston's Route 128, and Joint Venture Silicon Valley as the catalysts for UIPs in the U.S. (Etzkowitz & Zhou, 2018; Owen-Smith, 2018). The success of these war-time joint-research

ventures between the U.S. government, academic researchers, and industry drove more university-industry-government partnerships in the post-war era.

In the 1970s, the U.S. Congress adopted new legislation, including the Bayh-Dole Act of 1980 which created patent rights for universities, in response to the success of Japanese technology policies and advances in technology created by Japanese tech firms and universities (Poyago-Theotoky et al., 2002). Subsequently, between 1980 and 1999 the total number of patents awarded to U.S. universities increased from 300 to 3,661 (Poyago-Theotoky et al., 2002). In the 1980s, the National Science Foundation also increased funding for Industry University Co-operative Research Centers (IUCRCs). As a result of this investment, the number of IUCRCs in the U.S. increased by 154% in the 1980s (Cohen et al., 1998). Universities and industry widely adopted this model within the U.S. and abroad; industry and academia have partnered to establish research parks and centers in nearly every developed nation (Poyago-Theotoky et al., 2002).

Japan

Scholars trace collaboration between industry and universities in Japan back to the founding of the first engineering university department in the world, the Department of Engineering of Tokyo University in 1873 (Nagaoka & Flamm, 2009). In the late 19th and early 20th centuries, Japan emerged from a self-imposed isolation and began an industrialization campaign which relied on the import, adaption, and improvement of foreign technology (Nagaoka & Flamm, 2009). This effort included the adoption of a national university system and elite private universities which Japanese leaders credited for the success of U.S. industries in technology innovation. In the 1950s, Japan reemerged from the economic destruction of World War II because of their ability to produce transistors for consumer products (Nagaoka & Flamm,

2009). Japanese tech firms quickly became competitors for American companies; this competition would go on to spawn decades of co-evolving policies and practices between the two nations (Nagaoka & Flamm, 2009). The success of U.S. policies led Japan to adopt similar measures in the 1990s to maintain a competitive edge with U.S. firms (Nagaoka & Flamm, 2009).

Europe

Until the 21st century partnerships between academia and industry in Europe where neither encouraged nor easily facilitated because of the statist model of most European nations in which power and decision making are centralized at the national level (Etzkowitz & Zhou, 2018). While UIPs in the U.S. increased and grew stronger in the post-War World II US economy, European nations spent most of the decades following the war rebuilding national infrastructure and building the European Union (EU) coalition. In Cold War era the EU coalition united behind the perceived need for the EU to develop nuclear capabilities (Borrás, 2003). Despite uniquely different national university systems across EU nations – European leaders developed universally governing policies for UIPs and intellectual property (IP) in the 1980s and 1990s (Borrás, 2003).

In the 1980s, programs such as the European Strategic Program for Research and Development of Information Technology (ESPRIT) and the European Research Co-ordinating Agency (EUREKA) continued to drive the growth of UIPs in Europe (Poyago-Theotoky et al., 2002). Despite these EU policies, U.S. and Asian firms accounted for more than 80% of patent applications filed in the 1990s (Hall, 2009). Across Europe, nations have found success with different approaches to UIPs. In Italy university-affiliated incubators within science parks have proven to be a successful strategy to address the lack of technology-based firms nationally

(Etzkowitz & Zhou, 2018). In the U.K. between 1972 and 1999, the number of university science parks increased from 2 to 46 (Siegel et al., 2003).

While rare in the 20th century, today nations across Europe attempt to replicate the success of U.S. and Japanese UIPs (Etzkowitz & Zhou, 2018; Poyago-Theotoky et al, 2002). This growth trend is not isolated to the EU. Since the 1980s UIP formation has increased in the U.S., Japan, and EU due to globalization, policy changes, and economic drivers of a knowledge-based economy (Lee, 2000; Poyago-Theotoky et al., 2002; Etzkowitz & Zhou, 2018).

Literature

The literature, history, and data reviewed below provide evidence that UIPs (a) are a validated strategy to promote research and innovation within higher education, with (b) unrealized potential, and (c) may help institutions address 21st century challenges. The history and growth of UIPs is essential to understand the purpose and context of my study. The reader unfamiliar with UIPs must first understand their history and evolution before turning their attention to potential of UIPs to address future challenges, and how the structure and organization of those UIPs may influence their success.

Challenges for the Future of Higher Education

Today many researchers examine UIPs because of their potential to address several challenges related to the future of higher education (Alves, 2015; Jones, 2009; Lutte & Mills, 2019). Some of those challenges include: (a) addressing workforce skill gaps, (b) identifying alternative revenue streams, (c) securing support for research, and (d) re-connecting with communities. Curricular collaborations between universities and industry are an effective strategy for addressing skill gaps in the workforce. Lutte and Mills (2019) described one such collaboration between a university and the airline industry to fill the gap in airline pilots. Alves

(2015) also described how UIPs can support study abroad experiences for undergraduate students, and how those experience can be integrated into the existing curriculum. Such curricular collaborations may also lead to the development of continuing education programs as well (Jones, 2009).

The financial crisis and recession within the last two decades have highlighted the fiscal vulnerability of some university business models. UIPs offer an opportunity for universities to adopt an entrepreneurial mission or mindset to generate revenue that can offset administrative and operational costs. Entrepreneurial universities and UIPs pursue research that is readily identifiable as economically or socially valuable and set up mechanisms to commercialize the results of that that research to generate revenue from patents, licensing fees, and spin-off companies (Etzkowitz & Zhou, 2018).

The history of UIPs began with funding applied and fundamental research projects, and UIPs continue to be a fruitful, and under-utilized source for research funding. In 2018, the U.S. federal government funded approximately $38 billon in higher education R&D expenditures in science and engineering, whereas businesses contributed $4.3 billion in funding during that same period (National Science Board, 2020). While not all UIP funding goes toward R&D efforts in science and engineering, this statistic does show the current disparity between funding for R&D and highlights the room for growth in industry funded R&D within higher education. UIPs and industry-university consortia also lead to new knowledge generation and the development of new research tools and artifacts (Jones, 2009).

Finally, UIPs offer a path for universities to re-connect with both their local and professional communities. Universities can be anchors for communities and build resilience across a region when partnerships are built with local industries and community organizations

(Owen-Smith, 2018). In a climate where higher education must prove its value and return-on-investment for tuition – building stronger partnerships with industry and the community can communicate the value of higher education to professionals and citizens alike.

A university's motivation for pursuing a partnership with industry may include securing research funding, developing technology for commercialization, or creating opportunities for students. University and industry leaders are increasingly pursuing UIPs as a solution for many of the challenges that both sectors face in the 21st century. In addition to addressing many of the challenges that universities face, collaboration between industry and academia has the potential to "advance social science, benefit society, and help industry" (King & Persily, 2020. p. 1). Miller and Le Boeuf (2009) also described how UIPs benefit society and industry by strengthening local economies through start-up companies developed as byproduct of these partnerships.

University Industry Partnerships

Writing and reflections on the promise of UIPs date back to the 1940s and World War II era (Appleton, 1946; Egloff, 1943; Hawkins, 1945). Yet, formal academic research and study of these partnerships did not begin in earnest until the 1970s and 1980s (Martin, 1980; Prager & Omenn, 1980; Roy, 1972). These early writings largely focused on R&D collaborations which could bring efficiency and innovations to the development of new technologies. Today, researchers agree that university engagement with industry produces academic, social, financial, and political benefits (Livingstone, 2009). In recent decades, researchers examined the capabilities of UIPs to support research efforts (Fontana et al., 2006; Perkmann & Walsh, 2007; Martin, 1980), their implications for curriculums (Choy & Delahaye, 2009), instruction and teaching (Dagnino, 2014), and the development of professional skills (Siller & Durnin, 2013). A

sub-genre of UIP research explicitly examines technology transfer practices as a means to spur economic development and innovation. Scholars of technology transfer practices often point to the success of Silicon Valley and Stanford University's Office of Technology Licensing which generated $49.3 million in gross royalty revenue in FY2019 along (Stanford University Office of Technology Licensing, 2020). Additionally, the quantity of literature examining UIPs in developing nations has increased significantly over the last two decades. The scholarly research in this domain has even led to the publishing of books and edited volumes (Etzkowitz & Zhou, 2018; Frolund & Riedel, 2018).

Structural Components and Elements of UIPs

The organization and structural elements of UIPs are largely dependent of the scale and scope of the partnership. UIPs can take many forms including: (a) a firm contracts with university researchers to conduct research on the firms behalf, (b) a university contracts with an industry firm to commercialize IP held by the university, such contracts typically lead to (c) the establishment of a spinoff company between a researcher and industry where the university's only involvement is IP rights or licensing fees, (d) a university and firm contract together to pursue early stage fundamental research initiated by academic researchers with commercial implications, and (e) a firm and university partner together to jointly develop a technology or product (Poyago-Theotoky et al., 2002).

King and Persily (2020) suggested that the demand for user data held by industry firms for the purposes of academic research merits new models for UIPs. Because of this demand for user data and the increased emphasis on patent application, IP rights, and licensing revenue technology transfer offices are now a common element for UIPs. Williams and Barnett (2009) described how a technology transfer unit at the University of Washington supported UIPs and

knowledge transfer over several decades. The use of consortia to structure UIPs has also increased over time as part of the legacy of NSF's Industry-University Cooperative Research Centers Program (IUCRC) initiative (Jones, 2009). Many universities have also created offices of external affairs or liaisons as a one-stop-shop approach to support UIPs across an institution (Livingston, 2009).

The organizational structures of UIPs vary based on the scope and scale of the partnership. In the U.S. IUCRCs, research parks, and technology transfer offices are commonplace among UIPs focused on research since the policy changes of the 1980s (Poyago-Theotoky et al., 2002). University-affiliated research parks "are developments designed to work synergistically with neighboring institutions of higher learning" (Betteridge, 2009, p. 99). University-based incubators to promote technology transfer and new start-up businesses are another strategy used by academic institutions to encourage UIPs. Etzkowitz and Zhou (2018) describe such incubators as "an expression of the university's economic development and service missions," as well serving the research and educational missions of academic institutions (p.144). The basic model of university organized incubators include: (a) a selection process, (b) subsidized space, (c) shared services, (d) mentoring, and (e) networking opportunities (Etzkowitz and Zhou, 2018).

The models for UIPs are generally established and fall within the categories and types described above. The structure of these models however varies significantly based on the scale and goals of the partnership. The background provided above provides a foundation for this study's exploration of how these UIP models are structured, what components or elements are utilized, and finally what structures and components are most commonly associated with positive

outcomes. Data analysis and research findings categorize references to UIPs in the literature, structure, unique organizational features, and associated outcomes.

Methodology

The traditional literature review summarizes existing research and draws together themes and conclusions (Harden & Thomas, 2005). Standalone literature reviews are of great value to scholars in that they can save both time and effort required to synthesize a body of literature prior to conducting new research (Okoli, 2015). Such reviews also give practitioners an overview of the research and minimize the likelihood that a single study will influence policy or practice erroneously (Harden & Thomas, 2005). Harden and Thomas (2005) described how the term and approach of 'systematic' reviews emerged as a response to literature reviews which failed to accurately represent existing research and included research which lacked credibility. Systematic literature reviews are designed to avoid the flaws of traditional literature reviews they are guided by a search for all relevant research, an evaluation of the validity and reliability of that research, a mapping of the remaining research to the research problem, and draw conclusions based on the remaining sample of research (Harden & Thomas, 2005). Systematic literature reviews are also distinguished from other forms of literature reviews by their scope and rigor (Okoli, 2015). The definition of systematic reviews provided by Moher et al. (2009) provide a clear description of the methodology for this study:

> A systematic review is a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review (p. 123-124).

In addition to this guiding definition, I structure my study with two clearly formulated research questions, described above. In the following sections I identify the peer-reviewed and validated methods for data selection and analysis which also guide my study. Systematic literature reviews are an effective methodological approach to inform practice and policy in education (Davies, 2000). Based on prior use of systematic reviews to address matters of policy in education and UIPs in general, this methodological approach should then also serve as an effective means to examine my research questions.

Need for Systematic Review

Historically leaders formed UIPs on an ad hoc basis without a systematic approach to selecting, forming, structuring, and evaluating such partnerships (Frolund & Riedel, 2018). As a result, decision making regarding UIPs has not been guided by strategic plans, best practices, or audits of opportunities but rather by prior experience or convenience. Livingstone (2009) called on universities to answer the questions "which organizational structure" and "what is the best mechanism" when considering how maximize effectiveness within industry partnerships (p. 74-75). University administrators and industry CEO's often lack both the time and expertise needed to manage operations for UIPs, it is therefore difficult for these leaders to synthesize research findings and best practices regarding UIPs to guide their own decision making (Miller & Le Boeuf, 2009).

Frolund and Riedel (2018) called for UIP decision making to be led by university relationship mangers and for R&D units to pursue a more strategic approach to partnership formation. But even this approach to decision making is susceptible to personal bias and erroneous decision making based on small or unrepresentative sample sizes and individual experience. The complexity of UIPs and their long and short-term impacts on institutions

requires a collective approach to decision making when pursuing such partnerships. This approach runs counter to typical practices within US firms, but when leaders employ collective decision making – they can broadly secure support across the university (Marion & Gonzales, 2014).

While there is a growing body of research on UIPs and scholars have conducted systematic reviews of UIPs literature (Ankrah & AL-Tabbaa, 2015; Garousi et. al., 2016; Marinho et al., 2020; Nsanzumuhire & Groot, 2020; Perkmann et al., 2011), much of this research focused on single case studies and on the outcomes rather than the structure of the partnerships. Systematic literature review emerged as a methodology out of the field of medical research but has since been adopted in the social science and management fields as well (Ankrah & Al-Tabbaa, 2015). In the last decade, scholars have used systematic literature reviews to synthesize the growing body of research related to UIPs as well (Faisal et al., 2017; Garousi et al., 2016; Rybnicek & Königsgruber, 2019; Skute et al., 2019).

Marinho et al. (2020) examined, from a EU perspective, factors which enhance collaboration including: partner selection, collaboration management, interface management, the use of champions, long-term partnerships, and shared vision and strategy. Nsanzumuhire and Groot (2020) used a systematic review to examine the types of interactions within UIPs and collaborative mechanisms that guide those interactions including trust building, boundary spanning, and motivations for partnerships. Marinho et al. (2020) drew on an international sample to draw applications for practice in the EU, whereas Nsanzumuhire and Groot (2020) examined literature from developed and developing countries to make broad applications across political and geographic contexts.

Garousi et al. (2016) specifically examined challenges, best practices, and anti-patterns for UIPs focused on software engineering applications. Ankrah and AL-Tabbaa (2015) conducted a comprehensive review which synthesized findings related to organization, motivation, operationalization, facilitating and inhibiting factors, and outcomes associated with UIPs. Perkmann et al. (2012) explicitly examined academic engagement with UIPs through a systematic review. Other prior research takes a narrower view examining knowledge transfer and consortiums in UIPs with in individual developing nations (Faisal et al., 2017). Skute et al. (2019) used a bibliometric analysis of UIP literature to quantitatively identify thematic clusters within the body of research. Rybnicek and Königsgruber (2019) used a systematic review to develop a conceptual model of UIPs.

Such reviews are helpful, yet their scope is overly broad or too narrow in that they give overviews of UIPs or examine a particular context or setting. I did not locate any systematic reviews of UIP literature which specifically focused on identifying structural and organizational elements of UIPs to inform best practices on the formation and organization of UIPs. I aim to fill that gap with this systematic literature review by identifying specific organizational and structural features of UIPs across the body of existing literature. These questions related to structure and organization require the examination of multiple studies and interpretation and analysis of empirical findings across settings to inform practice and policy more broadly. A systematic literature view is the ideal and logical methodology to address the research questions presented and fill the gaps in the existing body of literature.

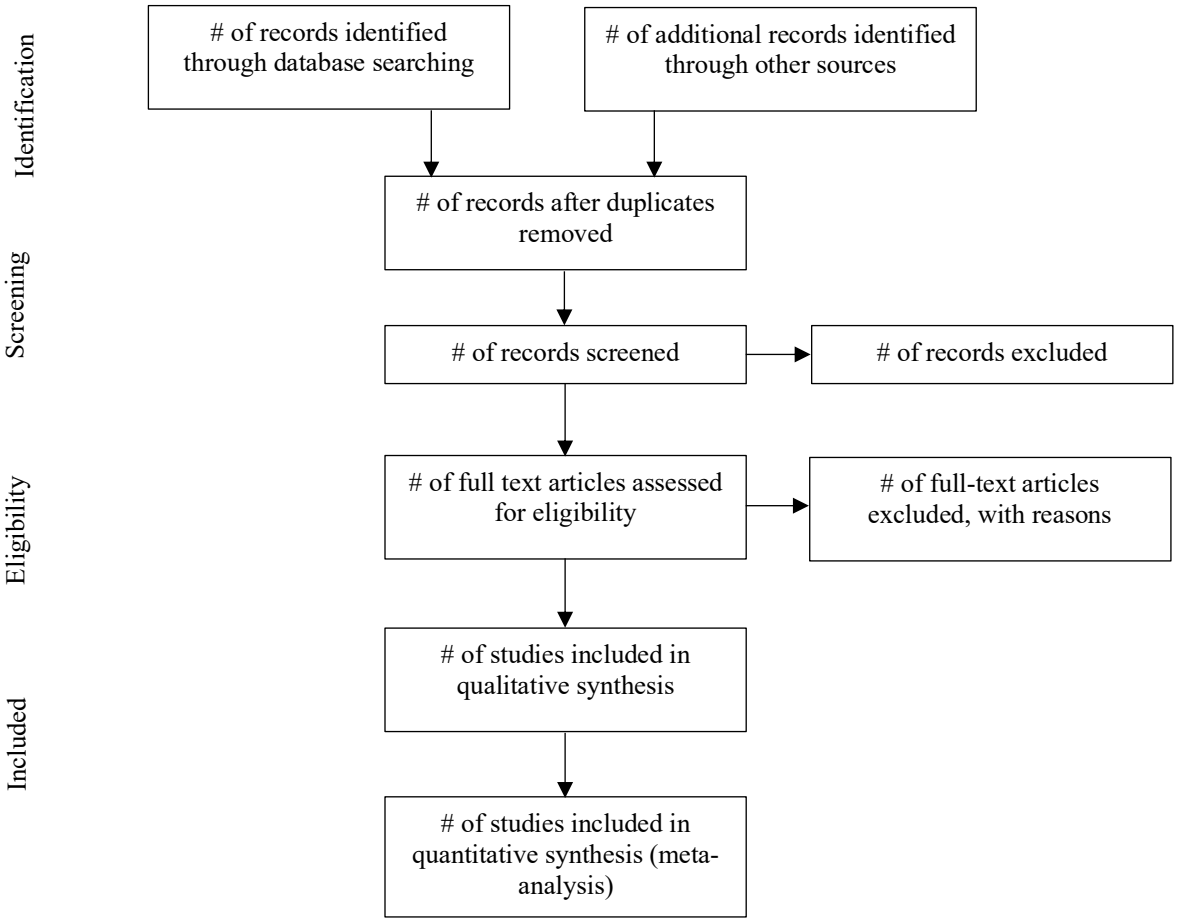
Systematic Review Methodologies and Research Design

The methodology for systematic literature review used by Kitchenham (2004) to examine research questions related to software engineering has been widely adopted by others across

domains (Gainsbury & Blaszczynski, 2011; Torres-Carrión, 2018; Wamba et al., 2015). Moher et al. (2009) also developed a methodology for systematic literature reviews (Figure 3) in health care that has been widely adopted by other fields including education (Ahmad & Junaini, 2020; Greenwood & Kelly, 2019; Lippard et al., 2017). A third framework for systematic literature reviews widely adopted across disciplines is the thematic synthesis technique introduced by Thomas and Harden (2008). This systematic literature review adopts the frameworks presented by all three of these widely adopted methodological approaches.

Figure 3

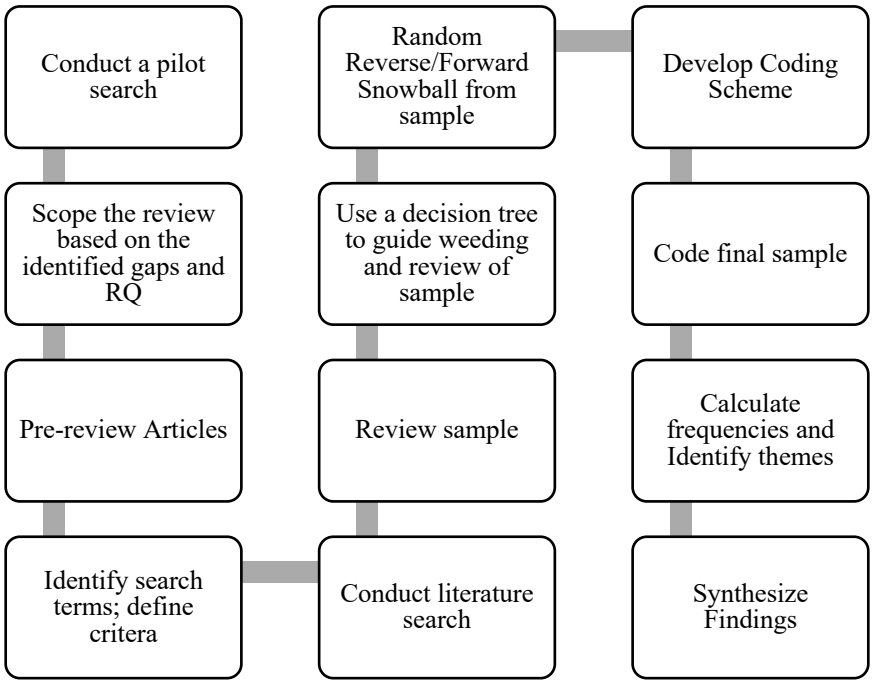
Phases of Systematic Review (Moher et al., 2009)



Moher et al. (2009) developed PRISMA as a response to and a revision of the QUOROM Statement to provide stronger guidance for systematic literature reviews and meta-analyses. Moher et al. (2009) revised previous guidelines to improve transparency and completeness of reporting in systematic literature reviews and meta-analyses. Researchers developed the PRISMA methodological framework by and for use in reviews of randomized trials within medical research, but with modifications can be applied to other methodologies and fields as well (Moher et al, 2009). The most significant contributions of the PRISMA methodology is the flow chart (Figure 4) and checklist (Appendix A) developed by Moher et al. (2009). The checklist developed by Moher et al. (2009) is a useful tool for the pre-review or practical screening of articles for inclusion in the final review sample. While many approaches exist for the pre-review process, I used the Moher et al. (2009) checklist for this study because of its comprehensive scope and established use.

Figure 4

Flow-Process of Methodologies



I based the designs and research methods used within this systematic literature review on foundational theories and best practices from prior systematic literature reviews across the field of education research. A review of existing literature on systematic literature review methodologies led to the development of a series of procedures appropriate for the research questions. Figure 4 reflects the process I used in this study to collect, refine, code, and synthesize data. Systematic reviews conducted by Ardoin et al. (2018), Davies et al. (2013), Harden and Thomas (2005), and Garousi et al. (2016) informed the development of this research design and review process.

Search for Studies

I used an iterative process to identify and refine search criteria. EBSCOhost served as the primary search engine to identify literature because of its capability as a mega-search engine. I included all affiliated EBSCOhost search engines in the initial searches because of the interdisciplinary nature of UIPs across academic domains and industry sectors. The final resulting keywords used in the search for articles included industry university partnership*, university industry collaborat*, industry university structure*, university industry interaction*, university-industry, academic-industrial collaboration, and academi* industr* collaborat*. The search for articles occured over 2 weeks in June and July of 2021.

I used forward and reverse snowball sampling to identify additional articles to include that I did not identify in the initial search. I also adopted snowball methods used by Garousi et. al. (2016) in this study; I randomly selected five articles in the sample pool using an excel formula. Articles selected by the random generator included: Reich-Graefe (2016), Todeva & Ketikidis (2017), Fischman (2007), Gunasekara (2006), and Kunttu et al. (2018). I reviewed articles citing these five articles (forward snowballing) and articles cited by these five articles

(backward snowballing) to ensure I included all relevant literature in the final sample pool. The snowball sampling procedure produced 154 additional documents which met the inclusion criteria of full text, date range, geographic region, and language of publication.

Within the methods used above, I also included *gray literature* as a supplement for relevant materials for inclusion in the study. For the purposes of this study, gray literature includes (a) reports by government agencies, non-profit groups, and professional organizations, (b) articles published in business magazines, (c) published conference proceedings, and (d) books published by academic and non-academic presses. I excluded electronically published dissertations and thesis papers from the data set.

Decision Tree

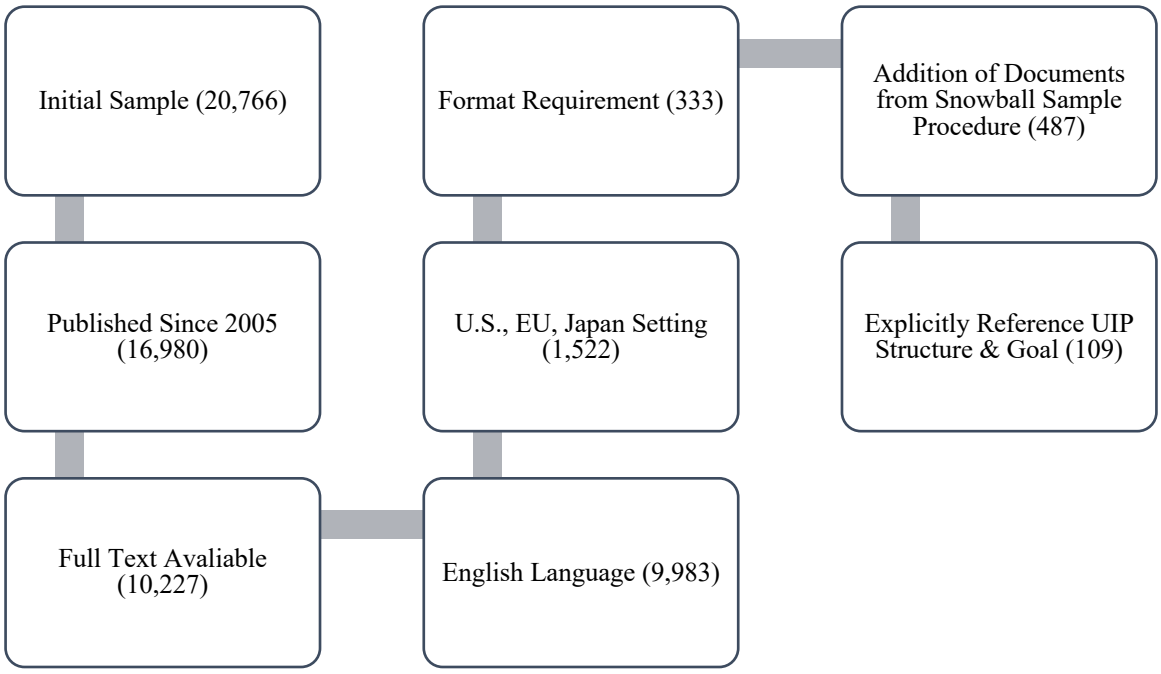
I developed a decision tree to guide the screening of studies for inclusion in the study (Figure 5). Forms of literature included in this review include (a) peer-review journal articles, (b) gray literature, (c) books and book chapters, and (d) conference papers and proceedings. I reviewed materials in the initial sample using the following criteria and removed non-conforming publications from the sample: explicit notations of UIP structure, full text available, published in English language, published since 2005, UIP set in US, UK, Japan, or European country without ties to the former Soviet Union, and goals of partnership are clearly stated. I removed any duplicated publications or findings repeated in an alternate form of publication (i.e. conference proceeding and peer-reviewed journal article).

I excluded materials which only examined TTOs from the final analysis because TTOs alone are not a partnership between academia and industry. In some cases, TTOs are represented within the data, but only when described as a part of a broader UIP with explicit goals and structuring elements. While UIPs in the U.S. date back to the 1940s, the structure, scale, and

scopes of these partnerships have evolved over time. This study only includes findings published since in 2005 in order synthesize UIPs as they exist in our modern technology and knowledge-centered economy.

Figure 5

Decision Tree for Article Inclusion



Political and national contexts inform the nature and structure of UIPs (Etzkowitz & Zhou, 2018); only studies which examined UIPs in developed, democratic, capitalist countries will be included in the study. UIPs only emerged in some democratic capitalist countries since the 1980s and in those cases limited national capacity contributes to slow adoption of UIP best practices. This study includes studies and articles from three nations and regions with the longest history and strongest infrastructure for UIPs (i.e., the United States, UK, European nations without ties to the former Soviet Union, and Japan,). Table 1 details the counts of articles included in the final sample for coding and synthesis from each setting.

Table 1

Counts of Regions and Countries in Final Sample

Region	Count
European Nations	58
United States	36
Japan	9
Multiple or combination of the three	6
Total	109

Synthesis and Coding Methodologies

I selected thematic synthesis as an appropriate approach for synthesis of the review because thematic synthesis adeptly captures the findings of qualitative studies. All the formal studies included within the sample were qualitative in nature as a consequence of inclusion criteria. I excluded most quantitative studies because they often included a large sample of UIPs and did not provide information on the goals and or structure of UIPs. I adopted Harden and Thomas's (2008) approach to thematic synthesis for this study. The methodologies first introduced by Harden and Thomas' (2008) for medical research have since been adapted to systematic reviews of literature in other fields including education (Ong et al., 2020; Van Lankveld et al., 2017). I selected QSR's NVivo software to assist with the coding and synthesis.

After I added the snowball sample and prior to line-by-line free coding, I classified files within NVivo to assist with organization review for inclusion in systematic review. I classified files as: book, case study, concept paper, editorial with sources, literature review, periodical (non-scholarly), quantitative or qualitative study, and report. None of the articles classified as

literature reviews met the criteria for inclusion. A breakdown of file classifications included in the synthesis phase of the study are detailed in Table 2.

I used a three-stage approach for coding and synthesis. First, I conducted a line-by-line free coding and annotation of the introduction, findings, and results sections of literature. Data from literature reviews and methods sections in peer-reviewed articles were generally not relevant to the guiding research questions. Second, I organized these initial codes and annotations into descriptive themes. Finally, I used the descriptive themes to develop analytical themes in response to the research questions. I documented this process in Table 3. I used NVivo software for coding and synthesis processes.

Table 2

Total Counts of File Classifications

File Classification	Count
Case Study	65
Qualitative Study	11
Concept Paper	10
(Periodical) Non-Scholarly	15
Book	25
Report	4
Editorial with Sources	2
Total	109

Table 3

Descriptive Coding Process

Descriptive Code	Frequency of References	Analytical Code	Frequency of References
People Involved	149	Personnel	210
Roles and Duties	48		
Relationships	6		
People Interviewed	5		
Entities	56	Structure Reference	210
Practices	48		
Organizational Elements	44		
Models	32		
Formal Agreement	14		
Size of Organization	5		
Workshops & Events	20	Time Spent	56
Meetings	15		
Teaching & Research	9		
Travel or Site Visit	7		
Employment & Exchange	5		
EU Sample	58	National Setting	121
US	41		
Japan	15		
Multiple	7		
Goal	162		
Example	91		
Defining Success	42		
Challenge	25		
Physical Space	17		
Industry Sponsorship	14		

While reviewing files to assess whether they met the final criteria for inclusion in the study, an explicit notation of UIP structure and goal/s, I also developed a coding scheme through an iterative process. Following guidance by Harden and Thomas (2008), the initial codes developed during the free-line coding stage of analysis are detailed in Table 3 as descriptive codes and themes. I then constructed and mapped analytical themes to descriptive codes to facilitate the interpretation, analysis, and response to the research questions.

I used the code 'National setting' during the decision tree process to classify files for inclusion. Because the notation of a UIP goal is a criterion for inclusion in the study rather than a subject directly related to the research question, I did not incorporate 'Goal' into an analytical theme. I discuss observations related to coded notations of goals further in the section on recommendations for further research.

Analysis

I developed four analytical codes to use for further analysis to address research questions. In the following section I examine each analytical code in further detail to extrapolate results, findings, and implications. I provide examples to give context to findings and implications and to give further insight into data analysis methodologies.

Structure

I organized six descriptive codes (see Table 3) into the broader analytical code 'structure reference.' Broadly, coding and data revealed that UIPs are structured in a variety of ways through both actions and individual actors. First, a goal, objective, or formal agreement is essential. Of the 109 documents analyzed, I documented 162 notations of specific goals, 14 mentions or formal agreements, and numerous examples of shared values and objectives. Ankrah and Al-Tabbaa (2015) acknowledged the importance of formal agreements, and Kuswahima

(2020) described one example in detail. Additionally, Alfonso & Romero (2020) provided an example of how UIP conflicts can be avoided by the use of contractual obligations. Cantu et al (2015), Weber et al. (2012), and Nakagawa et al. (2017) each provided an example of the role shared values, objectives, and understanding play in the organization of strong UIPs.

The limited use or notation of formal agreements to structure UIPs within this sample may be related to the deemphasis I placed on IP negotiation and technology transfer within my search criteria – both of which are well-researched subjects within the UIP field. A clear goal, formal agreement, and articulated shared values are not all needed to organize UIPs or ensure their success. But as the size and scale of UIPs increased additional layers of goals, shared values, objectives, and agreements became common. For example, student-project-based UIPs rarely made note of formal agreements (Allen et al., 2009; Baaken et al., 2015; Silva & Marques, 2020). In contrast, UIP alliances which involved multiple parties often noted a goal along with formal agreements or shared objectives (Bellgardt et al., 2014; Casey, 2005; Douglass, 2006).

Second, I noted limited references to the organizational structure of UIPs in literature and publications discussing UIPs. Only 22.4% of articles and publications which met the other criteria for inclusion also explicitly noted the structure of a UIP and its goal (see Figure 5). The data which does provide insight into the structure of UIPs suggested that a clear but flexible structure is important or common (Afonso & Romero, 2020; Maier, 2020; Thune & Gulbrandsen, 2011). Scholars who discuss policies, physical space, and the institution of higher education in the U.S. also identified flexibility as a theme (Casey, 2005; Clauson & Sheth, 2017; Office of Innovation & Entrepreneurship, 2014; Philbin, 2010; Rajala, 2017). Afonso & Romero (2020), Nian (2016a), Silva et al. (2018), and Fonseca et al. (2021) represent a sample of the data

which characterized UIP hierarchical structures as horizontal rather than vertical more often than not.

Personnel

I organized four descriptive codes into broader analytical code of personnel. Students, faculty champions, and administrators all played a critical role in the structuring and success of UIPs on behalf of the university. UIPs typically leveraged PhD students as research assistants (Fogelberg & Thorpenberg, 2012; Kunttu et al., 2018; Nian, 2016b; Todeva, 2013). While undergraduate and masters students are involved in team project based work within the context of a senior or graduate capstone course (Baaken et al., 2015; National Academies of Sciences, Engineering, and Medicine, 2016; Office of Innovation & Entrepreneurship, 2014). In some cases, these student teams were the central or only element of a UIP (Bridger & Ford, 2019; Durkin, 2016; Handfield et al., 2011). In other more research centered UIPs faculty champions and administrators played a larger role in determining the structure of the UIP. In the data scholars frequently notated the role and importance of champions for UIP (Albert & Elrahman, 2011; Berman, 2012; National Academies of Sciences, Engineering, and Medicine, 2016; Wessner, 2013). Historical evidence from the evolution of UIPs in Silicon Valley, MIT, and the Research Triangle supports this finding (Adams, 2005). Outside of the university, industry leaders, individual researchers, alliances, and government agencies structured UIPs at varying levels and degrees of involvement (Business Wire, 2016; Casey, 2005; Duan & Jin, 2021; Hansen et al., 2019; Philbin, 2010).

The final analytical theme related to personnel is – not only did personnel structure UIPs structured, but assessments likely underreport or estimate the quantity of personnel involved at both the individual and international-levels of UIPs. Within the data sample analyzed UIPs were

most often a group, team, or alliance driven effort. I did not find examples of UIPs described as only one individual from industry partnering with one individual at a university. In cases of small UIPs with limited personnel directly involved, the number of institutional, university, and government administrators who create and support policies which allow for the creation of UIP without their direct involvement is hard quantify – yet they are essential. Evidence supports the claim that the personnel involved in the structuring of UIP are best measured in the 100s or 1000s rather than by the handful or dozen (Albert & Elrahman, 2011; Araujo & Teixeira, 2014; Braunerhjelm, 2007; Cantu et al., 2015; Hepburn & Wolfe, 2014).

Time Spent

My analysis revealed an unexpected analytical code and theme – 'time spent.' This analytical code included descriptive codes: (a) workshops and events, (b) meetings, (c) teaching and research, (d) travel or site visit, and (e) employment and exchange. We rely on time as a construct for the structuring of activities during an individual day or year – but rarely do we use time as a construct to define the structure of a relationship. Analysis of the descriptive codes noted above suggested that UIPs are indeed structured by time – namely time spent together. Thirty percent of the 109 documents included in the analysis phase of the study noted how time played a role in structuring UIPs. Data suggests that time spent together builds relationships (Berman, 2012; Hansen et al., 2018; Weber et al., 2012) – and at its most fundamental level a UIP is just that – a relationship. Thus, time should be allocated to meet, gather and communicate in a variety of forums and with frequency. Meetings as described by Berman (2012), Casey (2005), Global Focus Magazine (2021), and Weber et al. (2012) were the most essential and minimum threshold for time spent together. Events such as workshops, symposiums, and conferences were the most noted examples of time spent together (Baraldi et al., 2016; Duan &

Jin, 2021; Roman et al., 2020). Teaching and research, travel or site visits, and employment and exchange programs were common mechanisms for spending time together within UIPs with high levels of commitment (Jusslia et al., 2020; Kuttu et al., 2018; Nian, 2016; Pflitsch & Radinger-Peer, 2018).

National Settings

Multi-party partnerships were common in both Europe and the U.S., but the people incentivizing and organizing those efforts differed. Within the European sample regional governments took a more active role in organizing UIP alliances, most often for the purposes of workforce development or economic revitalization (Bellgardt et al., 2014; Charles et al., 2014; Eerola et al., 2015; Hague et al., 2018; Rantala & Ukko, 2019). In the U.S. regional and state governments supported UIP organization, but most often federal funding incentivized the creation of new multi-party UIP (Casey, 2005; Clark, 2010; Ford et al., 2010; Johnson, 2018; Suk et al., 2018). Only 9 of the 109 files included within this review addressed UIPs in Japan specifically, therefore I do not make any claims regarding distinctive characteristics of Japanese UIPs. One observation within the small data sample of Japanese UIPs which deserves further examination is the role that personal relationships and federal policies play in motivating the formation of UIP in Japan.

Findings

The data analysis and results stemming from this systematic literature review directly addressed this study's first research question – how are UIPs structured? Broadly the data suggested that UIPs are structured by the (a) the people involved and their personal relationships with each other, (b) horizontal de-centralized organizational structures, (c) shared goals, objectives, or formal agreements, and (d) time spent together in meetings, events, and through

travel and site visits. These same findings also applied to the study's second research question – what structuring practices are most often associated with positive outcomes. These findings and their associated implications are discussed in further detail below.

National setting did not appear to have a significant impact on the structuring of UIPs in U.S. or Europe. Japanese examples of UIPs had some of the same characteristics as European and U.S. UIPs including an emphasis on personal relationships and influence of national policies, despite a small sample size ($n = 9$). These findings are supported by the shared history and co-evolution of UIP policy in three national and political contexts examined within this study.

The data collected through the systematic literature review process and research methods, which did not meet the criteria for inclusion, ultimately validated my own anecdotal experience. Most academic literature and published work on UIPs did not examine UIPs at the micro-level, and thus scholars did not document structure and goals of individual and successful partnerships. For example, prior to coding for partnership structure and goal criteria the data sample included 77 files classified by the researcher as *concept papers*. The file classification concept papers included new theoretical frameworks, taxonomies, and criticisms of existing theories, frameworks, and taxonomies – but these forms of scholarly writing employed broad brushstrokes and rarely spoke with any level of specificity.

The diversity of domains and fields represented within the data sample also suggests that UIPs are not exclusively pursued by one field or domain. The preliminary data collected, and final sample, included perspectives on UIPs from a diversity of academic domains and industry fields. The data also included perspectives of economists, business leaders, academic administrators, researchers, and government entities.

In regards, to this study's second research question – what organizational structures and strategies are most likely to be associated with positive outcomes – the answers were less clear. Within the coding. researchers or publications defined success by some metric or identified a positive outcome in at least 44 instances. I found no studies or articles within the sample which explicitly discussed negative outcomes associated with UIPs. Often writers or researchers reframed a failure to accomplish a goal as a success because they achieved other goals or objectives instead. Thus, I conclude that the same findings which applied to how UIPs are generally structured, also apply to how successful UIPs are structured. Scholars should conduct additional research to better understand the association between UIP practices and positive, or inversely negative, outcomes. Such research should approach the question from the negative lens, i.e., what practices are associated with failed UIPs or UIPs who do not accomplish their goals and objectives. This approach avoids the error I encountered within this study with a lack of examples to compare effective and ineffective practices.

Discussion

While none of the findings discussed above contradict the larger body of research in this field, three findings in particular make sense in regards to the current body of literature and knowledge related to UIPs. First, the role that shared goals, objectives, and formal agreements play in structuring UIPs are no surprise given the emphasis on IP agreements and negotiations within UIP literature and the role that funding and return on investment plays within UIPs. Following the passage of the Bayh-Doyle Act UIP leaders and scholars emphasized technology transfer and IP generation (Al-Tabba & Ankrah, 2019; Perkman et al., 2013; Williams & Barnett, 2009). As a result, UIPs increasingly relied on both legal and non-binding MOUs to guide these activities (Frolund & Riedel, 2018). The use of these practices for technology transfer and IP

negotiation have since spread more broadly to other UIP activities including fundamental research, student programs, and contract-based work.

Second, the lack of differentiation among national settings for UIPs can be accredited to the co-evolution of UIPs around the globe. As detailed in the literature previously, UIPs have not evolved in isolation; instead, most national traditions and approaches to UIPs trace their history back to early UIPs in the U.S., Japan, and Europe during the post-World War II era through the 1980s (Etzkowitz & Zhou, 2018; Nagaoka & Flamn, 2009; Poyago-Theotoky et al., 2002). Though I did not include UIPs in developing and socialist nations in this study, they too can be viewed as a response to the successful capitalist UIP ventures in the U.S., Japan, and Europe.

Third, the lack of literature eligible for inclusion within this study reflects the larger body of published literature and the gap I perceived in that literature. Much of the peer-reviewed research related to UIPs has focused on either the challenges faced when creating UIPs or proving their merit and value to skeptical audiences (Clinton, 2014; Frolund & Riedel, 2018; Isaksen & Karlsen, 2010; National Academies of Sciences, Engineering, and Medicine; 2016). This is valuable and needed scholarship, but an overemphasis on addressing challenges and justifying the pursuit of UIPs has left a gap in literature related to the fundamentals of UIPs – of concern within this study are the fundamental structuring practices of UIPs.

One observation from the non-peer reviewed articles included within this sample may provide some insight. I noted at least two examples within the sample of non-peer reviewed articles that described leaders for new UIP initiatives based on their prior success with UIP projects of smaller scale. Those who develop and deploy practices that lead to success in UIPs have a variety of options for financially lucrative promotion through the profession (Business

Wire, 2017; Business Wire, 2016). The publication and sharing of best practices could be perceived as a divulgement of expertise needed for professional advancement in the field.

Take for example the high-stakes and highly lucrative world of coaching for U.S. collegiate sports. UIPs have a hybrid academic-business nature similar to college athletics. Both originate with academic or intellectual pursuits, yet both are also revenue dependent enterprises. Rarely does a successful current coach openly describe or publish a detailed guide to achieve success. While some approaches to shaping culture and making investments in infrastructure can be copied – there are no detailed guides. The body of literature, and its inherent gaps, are reflective of a culture where stakeholders applauded sharing success internally – but avoid sharing a roadmap for other competitors to achieve that same success for self-preservation and to maintain a competitive edge.

This study fills important gaps in the literature by synthesizing UIP scholarship and structuring practices. My goal was to develop a synthesis to inform practice, but this research may also support future research as both a summary of prior research and analysis of existing gaps in UIP literature. If researchers continue to engage in UIP research at the current rate, it is necessary to simultaneously conduct literature reviews to assist new researchers and practitioners as they orient themselves to the field. The UIP research agenda is but one of many critical thrust areas which U.S. higher education, and land-grant universities in particular, must pursue to prepare for the future of higher education. The subsequent studies in Chapters three and four provide additional examples of existing gaps in scholarship and future research priorities.

Implications

Practice

The results and findings detailed above have implications for practice and provide direction for future research. First, higher education practitioners can use these findings to inform internal policies and practices related to UIP formation and structuring. The analytical codes and discussion of findings suggest that practitioners consider goals, personnel involved, time-investment, and review best practices internationally and locally to guide structuring of UIPs. Second, this synthesis is a useful tool for novice faculty and staff engaged in UIP activities and in need of an orientation to best practices. The studies and scholarship citied within this study include useful frameworks, best-practices, and case study which are of value to any professional involved in UIP activities.

Research

As I detailed above, this study addressed existing gaps in the literature and thus has implications for future research to further close the existing gaps in UIP scholarship. First, additional research is needed with an emphasis on UIPs at the micro- or individual level. While macro-studies of UIPs impact on economies and academic research are important, there is too little research on best practices for structuring individual partnerships. Second, the metrics, definition, and understanding of success within UIPs deserves additional research and conversation amongst experts. While this study did not aim to answer questions related to measures of success for UIPs – I noted and coded measures of success in the analysis as they related to the stated goals of the UIP. Themes related to success of UIPs that emerged included measuring success quantitatively including research output, human resource development, and

technology transfer, and the redefinition of success when UIPs result in alternatives from the initially identified goals.

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Chapter Three:
University Research Policies to Promote Research Production:
An Interpretative Policy Analysis

Introduction

Research in higher education supports the advancement of new theories, innovations, technologies, undergirds academic curriculums, and stimulates local and regional economies. A healthy and productive university research ecosystem is essential for research productivity, no single researcher or unit can compensate for inefficiencies in the broader organization. Stanford University (SU) and Silicon Valley are popular examples of the far-reaching impacts of university research production. Over the last century, SU research labs and spin-offs developed countless innovations including antibody therapies, the internet, and Google (Ewalt, 2019; Stanford University, n.d.). SU is consistently ranked as The World's Most Innovative University (Ewalt, 2019), and also considered one of the most elite and highly competitive private research universities in the U.S. (US News and World Report, n.d.). Meanwhile the region surrounding the university attracts global corporations, startup companies, and innovative thinkers – all looking to tap into the knowledge production which stems from the region's university-based research expertise (Etzkowitz & Zhou, 2018; Owen-Smith, 2018).

For decades university leaders, businesses, and politicians studied and attempted to replicate the success of Silicon Valley. Land-grant institutions have a unique prerogative to pursue such research-based ventures because of their unique institutional missions to disseminate knowledge and educate the working class (Gavazzi & Gee, 2018). In the 19th century land-grant universities provided education to the working class largely entailed education in agriculture and the mechanical arts and disseminated knowledge through cooperative extension offices to local farmers (Association of Public Land-Grant Universities, n.d.). Today the university policies that guide the development and dissemination of new knowledge and research are essential to pursue the land grand mission int eh 21st century. It is important to engage in both internal reviews and

policy analysis to discern how these polices affect research production at the institutional level, across all land-grant universities, and broadly across the U.S. university research ecosystem. The U.S.'s position as a leader in research is largely due to the role of university research. Maintaining current capital and expanding future capacity is essential for the U.S. to address both local and global challenges including global warming, pandemics, and cybersecurity.

The number of Nobel prizes, scientific papers, citations, and influence attributed to U.S. scholars, along with the ability of institutions to attract foreign researchers and establish firms positions the U.S. as a global leader in research a research policy development (Pavitt, 2001). However, the U.S. federal government can rarely take full credit for any of the metrics above. Instead, a combination of federal and university policies, federal funding, university resources, and industry engagement contribute to the U.S.'s highly productive research climate. The American research university is a critical component in the U.S. formula for research productivity. While various institutional types within the U.S. higher education system have the potential for knowledge production, research universities leverage this capability more than any other (Crow & Dabars, 2015).

Yet there is limited scholarship examining the intersection of policy analysis and research productivity in higher education. How institutions interpret and communicate research policies to faculty members and university researchers remains mostly unexamined in the literature. A striking gap considering Crow and Dabars (2015) claimed "their [major research universities] institutions represent our best hope for the survival of our species" (viii).

A Current Example

While this claim may seem startling and exaggerated, the role of university researchers in the development of COVID-19 vaccine technology provides a foundation to this claim. In 2020,

Vaccitech – a university spin-off company, developed the AstraZeneca COVID-19 vaccine in collaboration with Oxford University researchers (Vaccitech, 2020; University of Oxford, n.d.). University researchers in the 1990s developed the mRNA technology used within the Moderna and Pfizer COVID-19 vaccines (Garde & Saltzman, 2020). In 2020, Pfizer partnered with BioNTech, a small firm led by a former university mRNA researcher, and Oxford University to develop their vaccine (Garde & Saltzman, 2020). These prominent examples highlighted in the media overshadow countless university research projects formed in response to the pandemic. When Crow and Dabars (2015) published their claims, they believed that research universities would be our best hope in the face of a hypothetical global threat. Research universities rose to challenge during the COVID-19 pandemic through the pursuit of countless research projects in an effort to address the public health crisis (Association of American Universities, n.d.).

With that startling responsibility in mind, this study examines research policies to understand how policies, past and current, promote research in the rapidly evolving landscape of research and global challenges. Understanding how major U.S. research universities generate knowledge and produce research reinforces our national security, promotes economic prosperity, and supports the public good. This study examines how one land-grant university interpreted federal policies, crafted institutional policies, and communicated with university researchers to increase research production.

Research Question

The success of some research universities relative to their peers, with differing policies to guide research, is evidence that university policies do play some role in the influence of research productivity. University of Wisconsin-Madison (UWM) and Louisiana State University (LSU) are both land-grant institutions established in state capitals within five years of each other in the

mid-19th century. Yet in 2017, UWM ranked 7th in research expenditures nationally while LSU ranked 88th (National Center for Science and Engineering Statistics, n.d.). Many factors can explain the success of SU, John Hopkins, and MIT (Etzkowitz & Zhou, 2018) – yet they are susceptible to the same national policies as peer institutions with less success in research production.

There is uncertainty regarding to what extent institutional policies alone influence research productivity. Understanding the role that policies play in promoting research productivity at land-grant universities is important because (a) research is a fundamental component of their mission, (b) research capacity is critical to maintaining the relevancy of research institutions in the landscape of higher education, and (c) university research activities have implications for national security, the economy, and quality of life for all citizens. The following central research question addressed current knowledge gaps to better understand the relationship between university research policies and research production at land-grant universities:

1. How do institutional policies influence research productivity at Clemson University, a land-grant R1 Carnegie Classified institution?

Literature Review

History and Evolution of the Research University

Owen-Smith (2018) described the origin and history of the American research university as a "beautiful accident" (p. 34). There are a few seminal moments and factors within the shared history of U.S. higher education that are especially relevant to the history and future of the American research university. The founders of the earliest U.S. colleges adopted the Oxford and Cambridge models when establishing their institutions (Crow & Dabars, 2015). Later, The

Morrill Act of 1862 established land-grant universities across the then growing U.S. (Gavazzi & Gee, 2018). Eventually, the founding of John Hopkins University and the influence of Germany's University of Berlin led U.S. faculty and administrators to add graduate schools to established U.S. universities (Crow & Debars, 2015; Owen-Smith, 2018). Finally, in 1944 The Serviceman's Readjustment Act (GI Bill) expanded access to higher education, while decades of Cold War policies led to the establishment of federal funding for scientific research (Owen-Smith, 2018). The culmination of these events and factors resulted in the development of the U.S. research university as we know it today.

U.S. Research Production

Since World War II, the U.S. has been a global leader in basic research and the development of national policies to support those research efforts (Pavitt, 2001). While the U.S. continues to rank highly along metrics for research productivity, many European and Asian peers have closed the gap that existed 50 years ago (Pavitt, 2001). Maintaining high levels of basic and applied research is a national and institutional priority. An analysis conducted by Pavitt (2001) found that when adjusted for GDP and population, the global leaders in research production (defined by the number of published papers and citations) were the smaller European nations of Switzerland, Sweden, and Denmark. The U.S. ranked 7th globally in a review of Organization of Economic Co-operation and Development (OECD) countries; the U.S. ranked first in citations per paper in large part due to the greater number of researchers and longer history of academic research in the U.S. (Pavitt, 2001).

Public and private research-intensive institutions are distinguished from other institutional types and models by their research production. Land-grant research-intensive universities have the additional charge of supporting their state economies through the education

of the workforce and the generation of applied research (Gavazzi & Gee, 2018). Owen-Smith (2018) described research universities as a form of social insurance and investment because of their capability to improve well-being and address future challenges. Scholars have documented the success of U.S. federal policies that broadly encouraged research production in higher education. Scholars and historians alike credit landmark federal legislation such as the Morrill Land Grant Acts, Bayh-Dole Act, and The Hatch Act with enabling and fostering university research (Owen-Smith, 2018). Additionally, historians also chronicled the use of university-industry partnerships to promote research through the success of Silicon Valley, Massachusetts Route 128, and The Research Triangle (Etzkowitz & Zhou, 2018).

Policy

Because of the diversity of meanings associated with the term *policy,* I provide definitions and frameworks which guide this study. Trowler (2002) offered a rational-purposive definition of policy as "the explicit articulation of current actions or preferred action undertaken in pursuit of a state objective" (p.2). Trowler (2002) also acknowledged that this simple definition does not capture the messiness and complexities of policymaking and policy texts.

Ball (2004) offered two different conceptualizations of policy, "policy as text and policy as discourse" (p.44). These two conceptualizations serve as two general categories for policy research. Whereas *policy as discourse* generally refers to how we create, shape, and inform policy; *policy as text* refers more directly to the actual documents and messaging that inform actions, interpretation, implementation. Policy as text also emphasizes how users encoded and decoded policy complex in ways (Ball, 2004). Policy analysis methodologies assist researchers in examining how policies are encoded through the policy-making process and decoded through the policy implementation and interpretation process.

Policymaking occurs both formally through the creation of policy texts and more informally and creatively through the policy implementation process (Trowler, 2002). West (2004) described how public comment and rulemaking inform policymaking within bureaucratic organizations in both formal and informal ways. Within higher education, the practice of collecting public comments translates to opportunities for staff and faculty to give feedback on new policies. In higher education, West's (2004) rulemaking is the process through which associations and institutions of higher education interpret and enforce governing policies. Because of the capitalist nature of the U.S. economy and decentralized governance of higher education, the economic market is yet another informal influencer and creator of policies (Taylor & Miroiu, 2002). A recent example of this market influence includes the movement towards credentialing and badging undertaken by higher education institutions to meet an industry need.

University Research Policies: Purpose and Form

University research policies support the overall mission of the institution, research priorities, and research production goals. Policy frameworks (a) guide research activities across diverse disciplines, (b) provide support to new and established researchers, (c) ensure compliance with federal and state laws, and (d) reinforce ethical standards. Several factors affect research production, including cultural practices, political legitimization of a system, research assessments, and the overall climate of science policies (Auranen & Nieminen, 2010). Institutional priorities, federal policies, financial incentives, and economic trends each act to influence research productivity differently. Over the decades, American research universities became adept at adapting practices and policies in response to these influences to maintain or accelerate research activities (Auranen & Nieminen, 2010). This adaptability and success are why many nations attempted to replicate the American research university model.

University investment in research infrastructure and capacity is a long-term investment, and the dividends for effective new policies are felt gradually rather than overnight (Etzkowitz & Zhou, 2018). Stanford University's relationship with Silicon Valley firms serves as one example of how university investment in research infrastructure and local industry often takes decades to mature (Etzkowitz & Zhou, 2018). Other universities who have adopted similar policies to encourage technology transfer and university-industry partnerships are disappointed when those policies fail to produce immediate dividends (Etzkowitz & Zhou, 2018). What these institutions fail to recognize is that the university policies which guide interaction with Silicon Valley firms evolved over 70 years to create the successful world-renowned ecosystem of research and development that exists today.

Methodology

Both the scope and complexity of policy analysis necessitate multiple research methodologies (Ball, 1993). Nearly three decades ago Ball (1993) called for a "toolbox of diverse concepts and theories – an applied sociology rather than a pure one," to support policy analysis (p. 43). The field of policy analysis has since grown and evolved encompasses many conceptual frameworks, theories, and methodologies. Today, policy researchers and analysts can select and craft methodological approaches from the toolbox Ball described.

Rationale for Methodological Approach

The subject of this study, university research policies, informed the use of a policy analysis methodology. The term *policy analysis* represents a broad collection of methodologies that are both quantitative and qualitative in nature. Given the myriad of factors that influence research productivity – federal policies, economic climate, university leadership, institutional priorities, financial incentives – it is nearly impossible to identify a direct quantitative correlation

between university research production and policies. Thus, the research problem and questions necessitate a qualitative approach.

I selected an interpretative approach because in addition to formal policy documents institutional policies are often communicated informally through publications, reports, and briefs. Authors of policy texts cannot control the interpreted meanings of those policy texts, and the texts themselves are often incomplete and subject to revision (Ball, 2004). An interpretative policy analysis allows for an exploration of how users interpret and communicate these imperfect texts. Interpretative policy analysis acknowledges the role that the researcher-analyst plays in the meaning-making process, and in doing so, creates space for researcher positionality within the analysis (Yanow, 2007a). Interpretative policy analysis is also highly contextualized and does not emphasize the generalization of findings (Yanow, 2007a).

My social-constructivist epistemological perspective on research and knowledge also informs my approach to this study. I acknowledge that individual contexts and experiences cannot be generalized but believe that understanding individual contexts can inform our own experiences and practice. Interpretative research is ontologically constructivist and epistemologically interpretivist (Yanow, 2007b) – both of which align with my perspectives and worldviews as a researcher and scholar. The three hallmarks of interpretative methods include "word-based method and writing, researcher reflexivity, and the exploration of multiple meanings and their ambiguities" (Yanow, 2007b, p. 409), each of which I incorporate into my application of the methodology in this study.

Evolution of Policy Analysis

Wildavsky (1969) described public policy analysis in the 1960s as both a tool for social change and "an art form; there are no precise rules about how to do it" (p. 190). While

Wildavksy described the promise of policy analysis to address matters of policy in the U.S. but also doubted the realization of that promise within the political and fiscal climate of the 1960s. In the early 1970s, political movements in the UK led to a transformation of education policy analysis (Ball, 2004). Then in the 1990s, policy research in both the U.S. and UK underwent another transformation as researchers selected methodologies with an emphasis on meaning, effect, and the interpretation of policies over more traditional tools and methodologies (Taylor, 1997). The subsequent application of discourse theories to policy analysis led researchers to examine policy documents as texts that users can interpret and place meaning (Taylor, 1997). Discourse Theory also introduced the idea of multiple readings and meanings to a policy text (Codd, 1988). As a whole, Discourse Theory shifted policy analysis from an emphasis on policy formation and authorial intention to an attention on the readers' production of meaning and interpretations of texts (Taylor, 1997). The hermeneutical interpretative methodology I adopted for this study draws upon some of the earliest critical policy analysis research and applications of discourse theory to form a theoretical framework.

Interpretative Policy Analysis

Researchers have adopted Interpretative Policy Analysis (IPA) as a framework and methodology in various domains to address a diversity of research questions in education and business. Scholars in education have used IPA to examine the use of the background check policies in higher education (Owen, 2014) and the internationalization of higher education in the United Arab Emirates (Alsharari, 2017). Felix (2021) also drew on Yanow's (2007a) IPA framework to develop the Trenxa Policy Implementation Framework in a study of race-conscious policy implementation for Latinx students and leaders. Researchers have also applied IPA in areas such as regional innovation policies (Arrona & Zabala-Iturriagagoitia, 2019),

disability employment policies for young adults and their effect on participation in the economy and workforce (Stafford & Marson, 2019), and the Native American Languages Act of 1990/1992 (Warhol, 2011). My use of IPA in this study contributes to and builds upon prior research. The applicability of IPA to a diverse array of policies in both education and the public sector demonstrates its value as a methodology to address the array of challenges higher education will face in the future

Researcher Positionality

When practicing qualitative interpretative policy analysis, researchers must acknowledge their own positionality related to the research question, policies examined, and research setting (Yanow, 2007b). The ontologically constructivist and epistemologically interpretivist perspectives of interpretative researchers necessitate that they acknowledge their own presence and consider how that presence affects their research (Yanow, 2007b). The researcher's presence is important within interpretative methodologies because the researcher holds great power in the interpretation of policy documents. Along with the researcher's presence, the background and the experiences of the researcher are also important, according to Yanow (2007b):

> Interpretive methodologists call for heightened degrees of reflexivity on the part of the researcher: explicit attention to the ways in which family background, personality, education, training, and other experiences might well share who and what the researcher is able to access, as well as the ways in which he makes sense of the generated data (p.408).

As a staff member and part-time graduate student at Clemson University for more than nine years, my professional and academic work involved institutional research policies in different ways. Because I do not yet hold the credential of Ph.D. or a faculty position at the institution, I

am not a full member of the research community. As a staff member, I have supported several research projects through data collection or as a PI or contributing member on federal research grant proposals. I approach this study with familiarity but limited involvement with the research culture and enterprise at the case institution. This positionality allows me to hold tightly to my objectivity while still connected to and at times immersed within the research setting.

In addition to reflecting on my researcher status during the research design phase, I practiced researcher reflexivity throughout the data collection and analysis phases of the study. Corlett and Mavin (2018) described reflexivity as "a self-monitoring of, and a self-responding to, our thoughts, feelings, and actions as we engage in research projects" (p. 4). In this qualitative interpretivist study, I not only acknowledge my positionality relative to the research question and study site. I also practiced self-monitoring of my responses, thoughts, and feelings relative to the research project. I have also documented these responses, thoughts, and feelings, and incorporated them into the study's discussion section.

DeWalt and DeWalt (2002) presented a scale to examine a researcher's positionality within ethnographic research that I used to frame my own engagement with the policies in this study. The scale of participation begins with non-participation and increases in levels of engagement from passive, to moderate, to active, and finally complete participation (DeWalt & DeWalt, 2002). Within the context of this study, *active participation* best describes my position in relation to the research question. DeWalt and DeWalt (2002) described active participation as almost full participation by the researcher in the activities in question to fully understand the culture – while not yet considered a full-member of the culture or group in question. This level of engagement best reflects my own experience as a staff member and part-time graduate student who engages in and supports research at the institution.

Selection of Research Methods

The work of policy analysis draws on various research methods to address a specific framing of a problem, including document analysis, surveys, interviews, and statistical modeling. The availability of various research methods for policy analysis results in blurring the lines between research and practice in policy analysis (Yanow, 2007a). As a practitioner-scholar this blurring aligns with my own positionality – as practice and research are not merely connected but intertwined.

Within this study, I define *document analysis* as a qualitative review, evaluation, and interpretation of both documents and webpages. Documents used within this study include (a) published current and archived university research policy guides, (b) directories of resources for faculty and researchers, (c) guides and resources available for download by the institutional office of research, (d) press releases and newsletters regarding research production, (e) policies, and (f) procedures, strategic plans, annual reports, and webpages.

Hermeneutical Interpretative Policy Analysis

Yanow (2007a) offered two philosophical approaches to interpretative policy analysis: phenomenological and hermeneutical. Phenomenological analysis generally involves an examination of the participant or researcher's life and world to understand the research question, or policy in question, through the individual's experience (Smith & Osborn, 2012). The hermeneutic philosophical perspective, which grew out of theology and literary theory, describes the analysis of artifacts by examining the meanings people imbed within them and project onto them as they engage with the materials over time (Yanow, 2007a). Thus, a hermeneutic approach to interpretive policy analysis examines policy records, organizational correspondence and messaging, reports, transcripts of interviews, press releases, news articles, etc. In my study, I use

this approach to examine public policy documents, reports, webpages, and news releases to understand how university research policies and their meanings evolve, are maintained, and reinterpreted to foster research productivity.

Hermeneutical interpretative policy analysis does not only examine the meanings imbedded into artifacts but also how those meanings "are re-instantiated and maintained – or changed, as artifacts and their meanings are reinterpreted" (Yanow, 2007a, p. 114). The reinterpretation of artifacts is important for this study's research question outlined above because research productivity involves a constant interaction between researchers and policy artifacts. How a researcher interprets and understands policies over time through interaction with various artifacts determines their understanding of those policies – and as a result, influences the productivity and efficiency of their research activities.

IPA not only accounts for the reflexivity of the researcher but also posits that meaning does not lie within the text or the intent of the policy itself – but rather meaning in lies within the user's interaction with the text. Within this study, this theoretical perspective allows us to consider how faculty, staff, and students interpret the meaning of policy texts rather than the original intended meaning of the policy text. While understanding intent is a valuable analytic approach in policy analysis, interpretation, not the original intent, informs practice. Therefore, for this study, I selected a theoretical and methodological framework that allows for an examination of the interpretation rather than the intended meanings of policies.

Data Selection & Document Analysis

This study relied on documents and webpages as sources of data and material for analysis. Methodological approaches to document analysis informed both data selection and analysis. Broadly speaking, "document analysis is a systematic procedure for reviewing or

evaluating documents – both printed and electronic (computer-based and Internet-transmitted) material" (Bowen, 2009, p. 27). Documents were an appropriate form of data for this study because, among their many uses and purposes, they provided background information, defined the current context, and tracked changes to policy over time (Bowen, 2009).

Altheide et al. (2008) described the process of document analysis not as a "rigid set of procedures with tight parameters," but instead encouraged researchers to use an "explorer's eye" and be "flexible to the nuances, surprises, and confusion" within the process (p. 127). In accordance with that guidance, I selected documents for data analysis using (a) my knowledge of existing documents and sources, (b) the documents and sources referenced or linked to in the initial set, (c) documents that emerge through the process of exploration, surprise, and confusion. Wood et al. (2020) provided an example of this iterative process for document selection in a case study of qualitative document analysis. I adopted practices used by Wood et al. (2020), including transparency of data search, selection process, and criteria, along with examples of criteria and documents excluded from the final analysis within this study.

Because of my relationship to the institution and research site, I was familiar with several research policies and institutional strategic plans that included research. The search for data to include in my analysis started with locating those known sources. I then used a search engine built into the university's website to identify additional webpages and documents. This search resulted in the identification of webpages that allowed for a branch tree analysis of sub-pages and linked resources. I downloaded annual reports dating back to 2016 and included them in the analysis. The 2016 benchmark date coincided with revised institutional goals related to research and provided a substantive five-year arch of policy and research productivity revisions to analyze.

Analysis

The data collection methodologies described above resulted in 87 total documents. I uploaded and organized document files with the software NVivo to facilitate my analysis. I categorized these documents into four groups prior to analysis: (a) blog or news, (b) policy manual, (c) report, and (d) webpage. Then I reviewed files by group in the following order: (a) policy manual, (b) report, (c) blog or news, and (d) webpage. Thus, my review of reports, blogs, and webpages informed my interpretation of formal policy documents.

As recommended by the literature, I adopted a flexible approach to data review and analysis. I used NVivo's query criteria to assist with the review of documents. I used the keywords research, scholarship, grant, and proposal to guide the review of documents and draw my attention as a researcher to critical passages. I relied on extensive annotations, rather than developing a formal coding scheme to generate themes and findings. These annotations were reflexive in nature, made connections to other documents, posed questions, and at times made connections to my own experiences. I include a mapping of example annotations, file type, and connection to findings in Table 4.

After reviewing the original 87 documents collected, I determined that 55 had implications related to the research question. I made 196 individual annotations within these 55 documents using the NVivo software. I then exported the annotations to an Excel file and organized the notes by their associated file and connections to the research question. After reflecting on each of these individual annotations and responding to my own annotations with additional notes and reflective questions, 55 annotations emerged with meanings and implications related to the research question. I then developed themes and findings related to the research question with examples from the data.

Table 4

Example Mapping of Annotations, File Type, and Connection to Findings

Example Annotation	File Type/Document	Connection to Finding
"A lot of these policies have been updated and approved in 2018, after the R1 classification was secured. How is this related? Does this align with the arrival of a VPR? What's the motivation for updating policies typically?"	Research Policy Manual	Theme : Action & Investment
"Priorities to increase productivity, quality, and $ are all rephrased here subtly."	Blog Post	Theme: Permeation of Communication, Messaging, and Language
"Changes in ways that research is recognized, increased expectations, and revised TPR processes to align with other R1 institutions are all part of increasing research productivity. Also of note, increasing the "quality and visibility of scholarship" i.e. publishing in more of the top journals - not just quantity, quality is important too."	Strategic Plan	Theme : Action & Investment

Findings

Three general themes emerged from the process of hermeneutical IPA. Those themes are presented and discussed below with evidence from the data sample to provide context and promote transparency. Finally, I discuss the challenge of hermeneutical IPA to consider how meanings are re-instated, maintained, changed, and reinterpreted within this case.

Theme: Action and Investment

Annotations and analysis supported the first theme: *institutional research policies and priorities inspire action and investment*. I documented a shift in policy and strategic priorities in 2016 to increase research productivity at the case university. A text analysis of reports, policy manuals, formal policy documents, and webpages revealed numerous actions coinciding with this change in priorities. First, the university crafted at least three new research policies in 2016, not in a response to any changes in federal or state regulations changes. Additionally, along with the approval of new research priorities by the institution's Board of Trustees in 2016 the university appointed a new Vice President of Research. Subsequently, the university updated and revised all institutional policies related to research within two years of establishing the new research priorities in 2016.

Additional actions and investments connected to the change in policies and priorities included the establishment of at least 10 institutionally sponsored seed-fund research initiatives. I identified these programs through a review of webpages within the university's web domain. The review of webpages related to research activities also revealed what I describe as a *buckshot-approach* to providing research support. Rather than providing researchers with a single resource, sole mechanism for recognition, or individual source for seed-funding, the data revealed the availability of multiple resources, avenues for recognition, and sources for funding for those involved in the research enterprise. It is unclear whether the administration based this approach on previously identified best practices, however policy priorities and the practices noted above did correlate with an increase in research productivity at the institution.

Theme: Consequences, Intended and Unintended

Analysis of policy documents and policy texts revealed a second theme, *research policies and priorities influence research productivity through intended and unintended consequences*. The first consequence of research policies and priorities observed was an emphasis on STEM-related research at the institution. Institutional research targets, the background of university administrators, and influence of federal funding priorities all contributed to this STEM-emphasis.

The targets associated with the research priorities focused on proposals submitted, efficiency, and award funds received – with particular emphasis placed on research proposals with large monetary awards. These targets, by nature, highlighted and promoted research in STEM areas. The university president, provost, and vice president of research of the case institution during this period of increased research productivity each possessed STEM backgrounds. Additionally, favorable economic conditions and continued federal investment in STEM research between 2016-2020 likely encouraged the pursuit of STEM research across many land-grant institutions during this same time period.

Despite the inclusive efforts of policymakers and administrators to include the social sciences and humanities when supporting and recognizing research, I observed limited recognition and support for non-STEM research in the data. Newsletters, workshops, and facilities dedicated to supporting research and proposal development were almost exclusively STEM-focused. I also documented a second consequence of research policies and priorities; official communication used *research-colored glasses* to view all activities at the institution. For example, in several instances data discussed the COVID-19 pandemic in regard to the impacts, both positive and negative, it had on the research enterprise at the institution. Additionally, the

administration presented research as the first of four emphasis areas in a 2016 strategic plan and the subsequent three emphasis areas each connected back to the research enterprise.

Theme: Permeation of Communication, Messaging, and Language

Research policies and priorities *permeated and influenced the institution's communication, messaging, and language at nearly every level*. Examples of this included: the Vice President of Research's Blog, descriptive language on university webpages, and the formatting and presentation of reports. One example of this phenomenon was the repetitious notation of the university's Carnegie classification as a R1 institution. Though the university identified as a research-institution before any changes to research policies and priorities in 2016, post-2016 the university described itself consistently as a research university emphasizing research productivity in reports and on public webpages.

I documented another example in the faculty manual where the first sentence of three successive paragraphs of the introduction mentioned the university's research identity. Reports on research productivity at the university also underwent a transformation after 2016. In 2016 the quarterly research report was a six-slide presentation of mostly bar-graphs and charts. By 2021, the format of quarterly reports had evolved into a more than 60-page professional report which detailed progress toward targets and highlighted successes in research at the institution.

Hermeneutical Findings

The meanings-embedded within institutional research policies and priorities in this study were reinstated, maintained, changed, and reinterpreted in several ways – both formal and informal. A formal review of institutional research policies at the university level reinstated the meaning of research policies to users. Based on document and text analysis the institution appeared to coordinate a formal review, updating, and reformatting of all research policies in

2018. This formal process allowed the administration to remove or update irrelevant policies. The process also ensured that the details of all research policies were familiar to those involved in the review process.

Various communication channels continually maintained the meanings and priorities of university research policies. The formal quarterly reports, VPR blog posts, and descriptive language on webpages all served to maintain policy priorities and meaning. The format of reports directly aligned with research policies and priorities in a formal manner, while the format and subject of VPR blog posts reiterated priorities and reminded researchers of critical policies in more informal ways. This same maintenance of policy through repetitious discussion and descriptive language also opened the door for changes to policy meaning changed through the process of constant re-statement by policymakers and review by the audience.

Policymakers formal and documented revision of university reach policies modified the meanings and implications of policies for users. These changes were largely subtle in nature and involved clarifying language or terminology. Externally new federal and state regulations also changed policy meaning and implications. I found documentation of this phenomenon in the revision history of research policies which documented both when the administration updated policies and ties to existing external regulations.

One of the ways that users reinterpreted the meanings of research policies was through workshops and individual consultation with research support staff at the institution. The review of the institution's web-domain revealed numerous opportunities for researchers to receive continuing education and support through workshops and consultation with personnel in research support roles. Both opportunities allow for the interpretation and reinterpretation of established

policies as questions, and new scenarios are posed. Users informally reinterpret policies by adding their own context every time they consult a published policy document or manual.

Discussion

Owen-Smith (2018) described how federal legislation from the 19th and 20th centuries enabled and fostered university research at U.S. universities; some legislation like the Bayh-Dole Act even influenced research policies globally (Etzkowitz & Zhou, 2018). While this policy analysis takes a micro-view on research policies by focusing on policies at one institution, the formatting of formal policy documents which referenced relevant federal and state policies documented the influence of federal legislation on the revision and creation of new institutional research policies. This enabled me as a researcher to track the influence of state and federal polices while communicating a rationale of policies to practitioners and researchers at the university.

This study validates Auranen and Nieminen's (2010) claim that many factors affect university research production – formal policy among the many. Auranen and Nieminen (2010) also credited American research universities for adapting practices and policies in response to external influences to maintain or accelerate research productivity. The case university within this study serves as one example of a land-grant university that successfully mastered that process. This evidence provides a foundation for additional research policy analysis with a larger sample of land-grant universities.

The findings within this study do not dispute Etzkowitz and Zhou's (2018) claim that research infrastructure and capacity is a long-term investment with dividends that pay out over decades rather than quarters. However, the findings do suggest that universities can create and sustain measurable growth over a short five-year span. While the Silicon Valley-level success is

not realistic for all institutions, these findings encourage research universities to pursue incremental increases in research productivity.

This study also helps us refine how we define policy and conduct policy analysis within higher education. The findings in this study support the definition of policy provided by Trowler (2002). Just as Trowler (2002) described, policy was both complicated and at times messy but was most accurately "the explicit articulation of current actions or preferred action undertaken in pursuit of a stated objective" (p.2). This definition accurately describes all of the formal policy documents and communication of policy priorities within this study. Other researchers in higher education should feel confident to rely on Trowler's (2002) conceptualizations of policy to guide their own research.

The use of hermeneutical IPA as a methodology within higher education research is still limited. This study provides a critical addition to the scholarship of Yanow (2007a, 2007b), Owen (2014), Alsharari (2017), and Felix (2021). The further development and implementation of this methodological approach for research within higher education is valuable because of its utility to practitioner-scholars and ability to produce university-specific insights as well as consider broader state and federal policy issues.

Implications for Policy, Research and Practice

Policy Implications

These findings have both implications for policymakers and provide direction for future research in policy analysis. For this hermeneutical IPA, I used a case university where research policy changes preceded an increase in research productivity. This study sought to better understand more specifically how institutional research policies influenced research productivity. The findings suggest that institutional policies can positively influence research productivity

when they (a) inspire action and investment in the research enterprise on behalf of the institution, (b) permeate all levels of communication and descriptive language regarding the institution, and (c) include specific targets and goals to measure progress. Policymakers who are crafting and revising university policies to increase research productivity should also keep in mind the consequences, intended and unintended, for crafting and promoting those policies. This policy analysis revealed an emphasis on STEM-related research tied to policy priorities, which may have unintentionally deemphasized research in the social sciences and humanities. Policymakers looking to increase research productivity through policy changes should also consider how such changes will impact other missions and functions of the university such as teaching and community service.

Research Implications

This study contributes to existing scholarship as a starting point for further policy analysis of university research policies. The current body of scholarship in this area is limited despite the relative importance of research productivity for large research-intensive universities. This study's primary limitation is its reliance on a single-site analysis. Future research should attempt to replicate findings across multiple-institutional settings and look for more direct correlations between specific policy changes and increased research productivity. Additionally, alternative policy analysis methodologies with less researcher-agency may further validate the findings within this study and address its inherent limitations due to the research methodology. Researchers should also look to see how policies can influence research productivity in ways other than those highlighted in this study and how policies can negatively or ineffectively influence research productivity.

Practice Implications

In addition to implications for policy and research, this study informs practice in higher education. First, administrators should consider how an emphasis on increasing research productivity will impact academic departments and research faculty across the institution. Not all academic disciplines reward and incentivize academic research equally. Within this study, policy actions successfully promoted research productivity by emphasizing STEM research and primarily providing support to pursue STEM research grants. This approach successfully promoted progress towards the stated goals and targets for increasing research productivity.

Balance for university's research portfolio is essential for interdisciplinary collaboration, resiliency in the face of shifting national priorities, and to ensure all members of the research enterprise can contribute. Administration can foster this balance through equitable distribution of recognition, resources and support and incentivizing interdisciplinary research. Leadership may also incentivize research that is service orientated, community-based, or addresses matters of cultural or social importance to incorporate all disciplines into research policy priorities. These considerations promote inclusion within the research enterprise. Without such initiatives, researchers not affiliated with STEM disciplines may struggle to see how their own research agendas align with institutional research priorities that center on grant submissions and research expenditures.

Second, when a university makes a significant investment in a policy priority, research related or otherwise, a shift in descriptive language and messaging about the institution related to the policy is a natural consequence. Stakeholders across the institution should engage in crafting and communicating policy. Practitioners can effectively communicate policy through reports,

webpages, and formal departmental meetings with consistent descriptive language and messaging across the organization.

Finally, hermeneutical interpretative research methods remind us that policies are in a constant state of interpretation and reinterpretation each time they are articulated and repeated. This serves as a benefit when policy meanings are unclear at first but can also lead to confusion if policies and priorities are misrepresented as they are discussed in more informal settings. Communication of and clarification of policy intention should come directly from policymakers whenever possible; additionally, policymakers should regularly check-in with those involved in policy implementation to monitor current understanding and interpretations of existing policies.

Conclusion

This study provided answers to the question – *how do institutional policies influence research productivity* and lays the groundwork for further research. The selected case institution, documents, and research methodologies suggest that university research policies and priorities influence research productivity through (a) inspiring action and investment, (b) by permeating all levels of university communication and descriptive language, and (c) through consequence designed and unforeseen. These findings have implications for any institution of higher education engaged in the research enterprise but are especially relevant for research-intensive institutions and land-grant universities seeking to expand their research capacity.

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Chapter Four:
Sense of Belonging and Part-time Graduate Students

Introduction

The projected decline in college-going students, due to lower fertility rates and declines in international student enrollment, will force U.S. institutions of higher education of all types to reassess their growth, recruitment, and enrollment targets (Grawe, 2021). Administrators must prepare for this challenge in the near future, as Grawe (2021) projected an "abrupt drop in the prospective student pool in 2026" (p.12). This decline in the prospective student pool is but one challenge for this new era of student recruitment within higher education in which the prospective pool of college-going high school graduates will diversify and shift geographically (Grawe, 2021). Faced with declines in the enrollment of both international students and traditional undergraduate students, many institutions of higher education will need to adopt strategies to adapt.

These predictions are based on models developed prior to the COVID-19 pandemic and do not reflect the impact that the pandemic had on birth rates or college going behaviors (Grawe, 2021). More recent analysis suggested that the pandemic created a "global baby drought" (Bosely & Jamrisko, 2021). European and Asian nations, including France and China, reported historic declines in birth rates along with the U.S. who projected around 300,000 COVID-19-related decrease in births (Kearney & Levine, 2020). Prior to the pandemic, approximately 1,000,000 individuals immigrated to the U.S. annually (Budiman, 2020). As pandemics continue to impact border closures, immigration rates, and travel universities may experience a decline of international students soon and longer than previously anticipated. After more than two years of pandemic impacted enrollment trends from international students some countries may now retain more students through the increased enrollment and revenue generated when students could not study abroad. As a result of these trends models run prior to 2020 which projected declines in

college enrollment in the coming decades statisticians may adjust these models to reflect an even greater decline in students in the year 2038.

Land-grant Universities may face unique student recruitment challenges in the decades to come. As Gavazzi and Gee (2018) explained, land-grant universities are uniquely tied to their regions because of their geographic-centric missions. Institutions of higher education of all types in New England and Midwest have already experienced challenges due to declines in birth rates in their regions and migration to and growth in the South and Western states (Grawe, 2021). Meanwhile public research universities are increasingly dependent on student tuition to support operational expenses after decades of state and federal divestment in higher education (Fischer & Ellis, 2021). In response many institutions recruited out-of-state and international students to bolster tuition revenue (Fischer & Ellis, 2021), but with both populations in decline, public research universities and land-grant institutions must again adapt their recruitment, enrollment, and business models. Options for adaptation include (a) expand the pool of students served, (b) become more competitive amongst peer institutions, and or (c) strategically reduce the size, scale, and expenses of the institution.

One possible option for land-grant universities is to expand their pool of eligible students by increasing programs and services for adult-learners, namely degreed-working professionals in need of continuing or graduate education. The shift towards on-demand continuing education and skill-development has gained momentum and may accelerate in the wake of the COVID-19 pandemic (Dellarocas, 2018; Schroeder, 2020). Brown (2012) described this shift as a move away from 20th century notions of leaning as obtaining a set of fixed assets, to a 21st century conceptualization of learning where learners constantly reinvent themselves and augment skills. In light of the rising cost of tuition and growth of the for-profit continuing education,

credentialing, and skill building market – many continue to call into question the value and relevance of the traditional four-year undergraduate or 2-year graduate degree. Land-grant universities have an opportunity to meet this growing need and fulfill their institutional missions to support their state workforce while reaching an underserved population.

Increasing services for working-professionals and part-time graduate students will require land grant universities to engage with a student population that is both diverse and often at-risk for high stop-outs. In the last few decades researchers in higher education have turned to the construct of sense of belonging (SB) to understand the needs of and effective interventions for at-risk and underrepresented student groups. While SB may seem like a new or trending topic, it has connections to some of the most foundational of learning and student development theorist including Abraham Maslow and Nancy Schlossberg (Strayhorn, 2019). SB is a current articulation of a fundamental need common across learners of all ages – to matter and feel included.

The growing community of SB scholars have studied a number of student populations including first-year (Hoffman et al., 2002; Morrow & Ackermann, 2012; Strayhorn, 2019), first-generation (Stebleton et al., 2014), Black (Hausmann et al., 2009; Strayhorn, 2019), Hispanic and Latinx (Dueñas & Gloria, 2020; Strayhorn, 2019), women (Le et al., 2016), LGBTQ (Vaccaro & Newman, 2017; Stout & Wright, 2016; Strayhorn, 2019), student veterans, and other marginalized, at-risk, or intersectional populations (Means & Pyne, 2017; Museus & Maramba, 2011). Researchers have also studied the intersections of these identities within specific contexts such as STEM, PWIs, and campus clubs and organizations. (Sax et al., 2018; Strayhorn, 2019). This community of scholars has yet to comprehensively examine SB for part-time graduate students, yet in 2018 approximately 1.3 million part-time graduate students enrolled at U.S.

institutions (Hussar et al., 2020). Such statistics indicate that the population of part-time graduate students in the U.S. exceeded the enrollment of Native Hawaiian & Pacific Islanders in all of higher education (Hussar et al., 2020), and greater than the number of U.S. military veterans using GI Bill benefits for their education (Marcus, 2017).

An Introduction to Sense of Belonging

A study of SB requires first clarification on the definition of the construct within this study. Many researchers have defined and examined SB as a construct. Rosenberg and McCullough (1981) described SB as a feeling of connectedness and that one is important and or matters. Hurtado and Carter (1997) advanced conceptual models of SB to examine the antecedents, specifically with Hispanic students. Strayhorn (2019) built upon Maslow (1962) to argue that SB is "a basic human need and motivation, sufficient to influence behavior" (p. 28). Strayhorn (2019) expanded on the foundational research above along with more recent studies to define SB within the university context:

> In terms of college, sense of belonging refers to students' perceived social support on campus, a feeling or sensation of connectedness and the experience of mattering or feeling cared about, accepted, respected, valued by, and important to the campus community or others on campus such as faculty, staff, and peers (p.4).

This definition frames SB as a cognitive evaluation (ex. "perceived," "feeling," "sensation"), context based (ex. "campus," "campus community"), and fostered by other individuals (ex. "faculty, staff, and peers"). Individuals may seek out SB in various arenas of life – community, religion, relationships, etc. – but within the university setting a number of elements across campuses including faculty, academic advisors, peers, clubs, and student organizations influence SB.

Growth in Part-time Graduate Enrollment

The growth in part-time graduate student enrollment is not limited to one domain or demographic group. In 2018, 35% of master's and doctoral students in science, engineering, and health were part-time (National Center for Science and Engineering Statistics, 2018). Only 26.5 % of part-time master's and doctoral students in science, engineering, and health identified as white males; the vast majority of part-time STEM students were female, Black, Hispanic, and or identified with other historically underrepresented groups (National Center for Science and Engineering Statistics, 2018). While scholars have explored SB for undergraduate students of color (Dueñas & Gloria, 2017; Hurtado & Carter, 1997; Strayhorn, 2019; Tachine, et al., 2017; Vaccaro & Newman, 2016), the literature lacks a similar exploration for graduate students. There is virtually no scholarship on SB for part-time graduate students or part-time graduate students from underrepresented and historically minoritized communities.

Connection to Future Challenges

Emotional responses to perceived SB, or lack thereof, range from joy and elation to suicide ideation (Baumeister & Leary, 1995; Joiner, 2010). SB is an important construct and tool to help practitioners support at-risk and marginalized populations within higher education because of its association with positive and negative emotional responses. Estimates on the percentage of graduate students who also work full time range from 45% to 76% (Alexander, 2020; Carnevale et al., 2015). Additionally, demographic trends have indicated that "American students are more likely to be older, non-white, female, and first-generation learners and to have military experience than ever before" (Alexander, 2020, p. 45).

As a result, traditional four-year institutions which have catered to white, male, 18–22-year-olds for much of their histories will welcome a very different cohort of students to their

campuses in the future. Fostering SB among these diverse students in physical and intellectual spaces where they were once not welcome – is critical for the long-term success of traditional four-year land-grant institutions. The first two Morrill Acts established a two-tiered segregated system of land-grant institutions with one group of universities serving only white students, and another group, known today as HBCUs, for African American students (Gavazzi & Gee, 2018). Land grant institutions allowed women to enroll beginning with the Morrill Act of 1890. However, in the early decades of land-grant universities female enrollment remained small, military affiliations prevented enrollment at some institutions, and curriculums for female students differed from their male peers in many cases (Thorne, 1985). Traditional land-grant universities did not desegregate until after the U.S. Supreme Court intervened and Congress passed the Civil Rights Act of 1964. For almost, 100 years land-grant universities catered to primarily male students and these same institutions only racially integrated 50 years ago. In the future, four-year land grant universities will serve and support and a student body which looks very different from their inaugural graduating classes.

Rationale for Study & Methodological Approach

While SB scholarship has expanded sin the 1990s, Strayhorn (2019) identified a number of gaps in the literature that remain. These gaps include: (a) an overemphasis on the individual rather than the role of the organization in SB, (b) how similar students experience similar circumstances but arrive at different levels of SB, and (c) the identification of specific mechanisms, attributes, or experiences that have a direct correlation with SB (Strayhorn, 2019). Additionally, in his own research Strayhorn (2019) addressed the gap in knowledge regarding the histories, motivations, and experiences of graduate students. I build upon his research to close that gap by examining more specifically SB among part-time graduate students.

Research Questions

This study fills the knowledge gap around SB for part-time graduate students to inform best practices. Scant research currently exists regarding SB for graduate students, and that which does exist focused on full-time traditional graduate students. My study has both theoretical and practical applications through the use of SB theories and frameworks with a new population of students. A greater understanding of the value which part-time graduate students place on SB will guide the practice of educators and inform the direction of future research for SB scholars.

I structured this study with the research questions below and through a survey of part-time graduate students with validated SB instruments and scales.

1. To what extent does SB matter for part-time graduate students?
2. What factors and outcomes are associated with SB for part-time graduate students?

Literature Review

Sense of Belonging

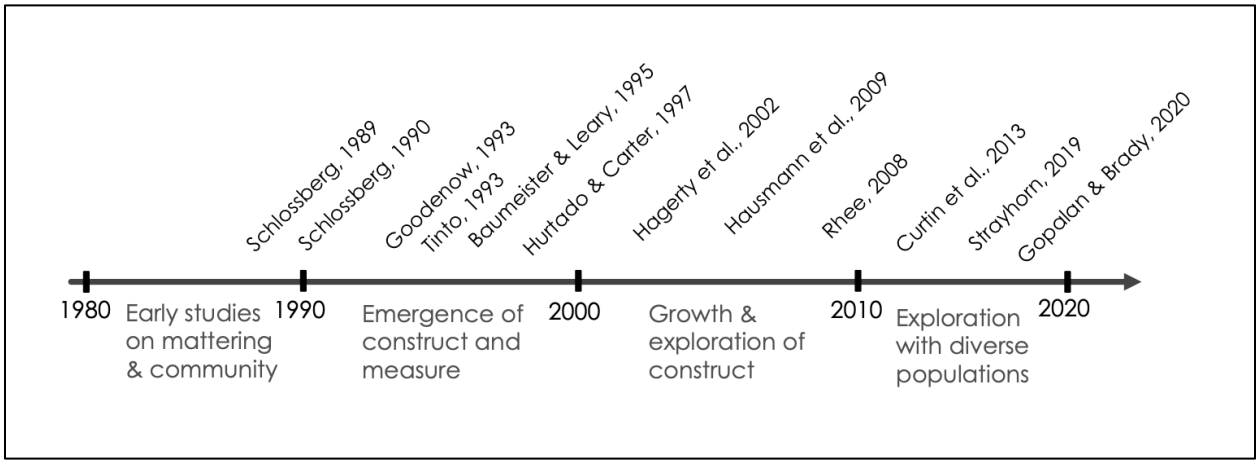
Research related to SB dates back to the 1990s, and includes scholarship related to mattering and community from the 1980s (Strayhorn, 2019). Schlossberg (1989) built upon her own research and connected mattering with questions of belonging and the role of marginalized identities. Schlossberg et al. (1990) examined college students' perceptions of mattering and importance with their Mattering Scales for Adult Students in Higher Education. Some of the earliest literature on SB focused on adolescents in primary and secondary school settings (Goodenow, 1993a; Goodenow, 1993b), but by the late 1990s scholars examined SB among college students and formalized a theoretical framework for belonginess (Baumeister & Leary, 1995).

Hurtado and Carter (1997) expanded on the existing research and Tinto's (1993) theory of student persistence to examine the antecedents of SB among Latino students. They found first year experiences to have a positive effect on the development of SB, while the perceptions of a hostile racial climate had a predictably negative impact on SB for Latino students (Hurtado & Carter, 1997). Hagerty et al. (2002) examined the potential childhood antecedents to SB among adult community college students and found that overprotective fathers, high school pregnancy, family financial problems, incest, and homosexuality all had a negative correlation with adult SB.

SB in higher education correlates with a number of positive outcomes including institutional commitment (Hausmann et al., 2009), academic self-efficacy and intrinsic motivation (Freeman et al., 2007), and use of campus services (Gopalan & Brady, 2020). In addition to these positive outcomes, prior research also highlights the role that SB plays in supporting student's psychological wellbeing. Strayhorn (2019) connected SB to psychological wellbeing in his description of SB as "a cognitive evaluation that typically leads to an affective and/or behavioral response" (p. 4). SB is merely one of many antecedents and factors which contribute to the psychological well-being of students and cannot serve as a sole predictor or facilitator of psychological health. Psychological health can also impact the physical health and lives of students; for example, Joiner (2010) studied links between feelings of isolation and a lack of belonging to suicidal ideation. However when the need to belong is satisfied, individuals report positive emotional responses such as joy, elation, calm, happiness (Baumeister & Leary, 1995). Rhee (2008) found a correlation with these SB cognitive evaluations and emotional responses and college student academic achievement, retention, and persistence (Rhee, 2008). I documented this evolution of SB scholarship in Figure 6.

Figure 6

Timeline of SB literature and research



Factors and Predictors of SB

Researchers of SB have also examined predictors and factors which influence or determine SB with some success. Prior research found that the perceived support of peers, teachers, and family members fostered SB (Strayhorn, 2019). On a college campus, this support can include "engaged teaching, providing academic supports, campus activities, positive messaging, and striving to build learning communities" (Strayhorn, 2019, p. 17). After understanding SB, its value, and the factors which influence its cultivation scholars then turned their attention towards understanding the relationship between SB and other variables.

Graduate Students

In the last 50 years, the number of part-time graduate students in the U.S. has nearly doubled; by 2029 analyst projected an enrollment of 1.365 million part-time graduate students in U.S. institutions of higher education (Hussar et al., 2020). Ambrose and Wankel (2020) used demographic trends and economic projections to argue that economic factors will drive tens of millions of adults to pursue some sort of continuing education in the coming decades. These

working professionals will choose between informal continuing education programs, part-time graduate programs, or pursuing a second degree full-time. A recent LinkedIn survey found that Gen Z learners (ages 18-24) spent more time in 2020 learning than the year before and plan to make more time to learn in the future (LinkedIn Learning, 2021). These learners are the next generational cohort of students to enter the postbaccalaureate pool of students.

Graduate Students and Sense of Belonging

One question which remains, and this study attempts to answer, is how much does SB matter to part-time graduate students. Because the majority of SB literature focused on undergraduate students, some scholars including Strayhorn (2019) used scholarship on graduate student socialization to draw conclusions on questions of SB and mattering for graduate students. *Graduate student socialization* generally refers to doctoral student integration into their programs and identity development as academic scholars. Findings on doctoral student socialization have questionable applications to masters-level graduate students in non-research-based programs.

Foundational and established andragogical learning theories may also help us understand the needs of part-time graduate students. Malcom Knowles (1977) foundational scholarship on adult learners and their needs established that the adult learner values self-directed learning, draws on valuable prior experiences, and relies multiple forms of motivation when pursuing education. Scholars continue to build on Knowles (1977) research. Hagen and Park (2016) examined how cognitive neuroscience validates core beliefs of andragogy to improve human resource development programs. Scholars of online learning have also applied adult learning theories to the development of online class environments (Cercone, 2008).

Curtin et al. (2013) found advisor support correlated with stronger SB for both international and domestic doctoral students. In a study of 1,533 graduate students across four institutions O'Meara et al. (2017) found professional relationships had the greatest influence on SB; additionally, non-STEM programs facilitated higher levels of SB than STEM programs. Pascale's (2018) research highlighted how SB constructs appear or manifest differently for graduate students. In a qualitative study, 15 graduate students described balancing graduate school with professional and personal life, relationships with peers, and relationships with faculty as important but different from their undergraduate experiences. These findings help to highlight the gaps in SB research as it relates to graduate students along with the promise that SB does matter to graduate students.

Methodology

This study was part of a broader study of SB for graduate students at a single four-year land-grant research university located in the Southeast. The broader study drew on qualitative and quantitative methods through both an electronic survey and interviews. For this study on SB for part-time graduate students, I draw solely on the responses to the survey by respondents who self-identified as part-time graduate students in the survey. In the following section I describe the methodologies employed for research design, participant recruitment, development of the research instrument (survey), data analysis, and validity.

Research Design

I chose to use quantitative and qualitative data collected via the survey and follow-up interviews for broader study for several reasons. First, it is convenient to collect cross-sectional data at a single point in time but to use that data for several different projects. Using survey responses also allowed me to collect my data more quickly (Creswell, 2014). The first study

conducted with this data set, described within, focused on quantitative analysis of the data collected. I based this quantitative analysis on participant responses to Likert-scale survey items. Such measures required participants to give a qualitative appraisal, which I then quantitatively captured using the Likert scale.

I also based my research design on peer-reviewed literature, validated, and replicated studies of SB using the Sense of Belonging Scales. Johnson et al. (2007) used similar SB survey-based research designs with racially and ethnically diverse first-year undergraduates, Morrow and Ackermann (2012) with first-year students, Soria and Stebleton (2012) with first-generation students, and Strayhorn (2019) with several student populations including graduate students.

A self-reported survey methodology is appropriate for this study for several reasons. First, an electronic survey is ideally suited to collect data from part-time graduate students who are more likely to be distance-learners (National Center for Education Statistics, 2019) and therefore visit campus less often, and also have additional work-life balance demands (O'Connor & Cordova, 2019). Second, because I am focused on capturing students' experiences as they navigate their programs, I am interested in their perspectives in a single moment of time which makes a survey approach appropriate for this study (Leedy & Ormrod, 2010). Third, I am also interested in students' perspectives on their own SB, so self-reported via a survey data aligns with the goals of this study (Leedy & Ormrod, 2010). Finally, an electronic survey affords the ability to send the instrument to a large number of people. This format as opposed to an interview or phone survey, yields a higher number of part-time graduate student participants, saves time for me as the researcher, and allows more autonomy to the participants in terms of when they choose to complete the survey (Leedy & Ormrod, 2010). Additionally, in the context of the COVID-19 pandemic, this is not only efficient but safe for participants.

Participant Recruitment

I recruited participants for the study through four electronic email listservs which provide information to graduate students in four different colleges at the institution. I selected these four colleges and listservs because they encompass the vast majority of part-time graduate student enrollment at the institution (n=75.4%). I list academic disciplines and programs included within the scope of this study in Table 5. Broadly the study included students from engineering, computing, science, business, and education programs. An estimated 5,600 students received an invitation to participate based on historical enrollments for programs included. The target response rate for the electronic survey was 15% or 853 completions of the survey. Response and completion rate fell short of the 15% target with 421 completions (7.4%).

Participants received two invitations to participate in the study, via college email list servs. Gatekeepers for each of these listservs provided and regulated access to the sample population. I sent the initial invitation to students one month into the fall semester, and a reminder email to all students 14 days later. I gave participants the opportunity to enter a drawing for one of ten $20 Amazon gift cards at the completion of the 10-minute survey as an incentive for participation. I also gave participants an opportunity to participate in a 30-minute follow-up interview and receive a $10 Amazon gift card at the conclusion of the interview. A combination of university and researcher funding provided funding for incentives. Electing to participate in the follow-up interview did not influence participants odds in the drawing.

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Table 5

Academic Programs Included in Study

Engineering and Computing	Business Programs	Education Programs	Science Programs
Automotive Engineering (MS, PhD, Cert)	Accounting (MPAcc)	Athletic Leadership (MS)	Biochemistry (PhD)
Bioengineering (MS, PhD)	Business Administration (MBA)	Counselor Education (MEd, EdS)	Biological Sciences (MS, PhD)
Biomedical Engineering (MEng)	Economics (MA)	Education Leadership (MEd, EdS)	Chemistry (MS, PhD
Biosystems Engineering (MS, PhD)	Graphic Communications (MS)	Human Resource Development (MHRD)	Environmental Toxicology (MS, PhD)
Chemical Engineering (MS, PhD)	Management (MS)	Literacy (MEd)	Genetics (PhD)
Civil Engineering (MS, Meng, PhD)	Marketing (MS)	Special Education (MEd)	Mathematical and Statistical Sciences (MS, PhD)
Computer Engineering (MS, PhD)	Economics, PhD	Student Affairs (MEd)	Microbiology (MS, PhD)
Computer Science (MS, PhD)	Business Administration, PhD	Teaching & Learning (PhD)	Physics (MS, PhD)
Digital Production Arts (MFA, MS)		Curriculum & Instruction (PhD)	
Electrical Engineering (MEng, MS, PhD)		Education Systems Improvement Science (PhD)	
Engineering and Science Education (PhD, Cert)		Educational Leadership (PhD)	
Environmental Engineering and Earth Sciences (PhD)		Learning Sciences (PhD)	
Environmental Engineering and Science (MS)		Literacy, Language, and Culture (PhD)	
Human-Centered Computing (PhD)		Special Education (PhD)	
Hydrogeology (MS)			
Industrial Engineering (MS, Meng, PhD)			
Materials Science and Engineering (MS, PhD)			
Mechanical Engineering (MS, PhD)			
Photonics Science (MS, PhD)			

drawing for one of ten $20 Amazon gift cards at the completion of the 10-minute survey as an incentive for participation. I also gave participants an opportunity to participate in a 30-minute follow-up interview and receive a $10 Amazon gift card at the conclusion of the interview. A

combination of university and researcher funding provided funding for incentives. Electing to participate in the follow-up interview did not influence participants odds in the drawing.

Survey Research Instrument

I adopted The Sense of Belonging Scales (Hoffman et al., 2002) for use within this study. I selected this scale because of its previous validation with other populations (Morrow & Ackermann, 2012; Strayhorn, 2019; Tovar & Simon, 2010) and because the survey terminology is more applicable to the graduate student experience. I could not find examples where researchers used the Sense of Belonging Scales to examine SB or questions of mattering for part-time graduate students. In addition to this scale, I asked participants a series of demographic questions and questions about their enrollment status including: (a) gender, (b) race, (c) citizenship, (d) ethnicity, (e) number of semesters enrolled, (f) estimated GPA, (g) number of credit hours per semester, and (h) program delivery method. I also asked participants to rate their degree of affiliation with different levels of the university (i.e. university, college, department, and program) and to which university campuses they identify. I include the 40-item survey instrument in Appendix B.

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citizenship, (d) ethnicity, (e) number of semesters enrolled, (f) estimated GPA, (g) number of credit hours per semester, and (h) program delivery method. I also asked participants to rate their degree of affiliation with different levels of the university (i.e. university, college, department, and program) and to which university campuses they identify. I include the 40-item survey instrument in Appendix B.

Analysis

I used an analysis of variance (ANOVA) to measure group differences between part-time graduate students and full-time graduate students. I set a significance level for all ANOVAs at $p \leq .05$. I then conducted multiple regression analyses across demographic groups including academic discipline, gender, and race. I used demographic categories as the independent variable, and sense of belonging rating the dependent variable. Finally, I conducted paired t-test and chi-square distributions on regressions and variables as appropriate based on the data generated by the survey**.**

I selected these data analysis strategies after a review of existing SB literature, prior uses of the Sense of Belongingness Scales (Hoffmann et al., 2002; Morrow & Ackermann, 2012; Strayhorn, 2019; Tovar & Simon, 2010), and because they aligned with the research questions. Existing SB studies generally fell into two categories large-sample surveys or interview-based research methods (Strayhorn, 2019). When investigating a previously unexamined research area with a large sample population, such as SB for part-time graduate students, a quantitative analysis and statistical tests can produce generalizable findings and implications. ANOVAs, multiple regressions, and paired statistical tests can reveal potential differences in how part-time graduate students self-report and value sense of belonging.

Validity

Validity generally refers to "how accurately a study answers the study question or the strength of the study conclusions" (Sullivan, 2011, p. 119). I reinforced the validity of my study, survey instrument, and findings by my use of (a) existing and validated survey instruments, (b) a transparent description of the development of additional survey questions, scales, and the relationships between variables, and (c) the use of follow-up interviews in the companion study to validate and clarify participant responses.

First, my survey instrument relies on the Sense of Belonging Scales first developed and validated by Hoffmann et al. (2002). A factorial structure and invariance analysis conducted by Tovar and Simon (2010) further validated this research instrument. Second, I provide a descriptive account of the development of the additional survey items and rationale for inclusion of demographic questions to promote transparency. Statistical tests comparing variables and responses ensures the validity of new constructs and informs findings based on demographic markers. I also conducted follow-up interviews with 16 participants, which served to validate face and construct validity.

I addressed face validity through the review of the survey instrument by various stakeholders, my dissertation committee, and a pool of potential participants. I also addressed face, content, and criterion validity by collecting feedback from a sample of 5 research participants prior to the release of the survey (Burton & Mazerolle, 2011). This review produced no threats to validity, only a few grammatical and formatting error which I correct prior to distribution of the survey. I addressed criterion-related validity through the comparison of newly developed measures with the existing Sense of Belongingness Scales. Participants responses with

newly developed scales correlated with responses to constructs within the Sense of Belongingness Scales – thus I included the new measures within my analysis and findings.

I constructed distributions and histograms of survey data related to the independent variables described above to assess for normality and skewness within survey responses. Responses for the four factors related to SB were visually normal distributions. I observed some instances of slight right (positive) skewness in the distributions of means for *perceived classroom support*, across all levels within the categorical independent variable *average number of credit hours per semester*. Additionally, I observed a slight right positive skew for *perceived faculty support* within respondents who identified as taking *3 or less* or *7-9* credit hours per semester. I also used distributions to identify outliers within the data set that might contribute to skewness. I removed two survey responses ($n = 2$) during this phase of analysis due to their skewness and non-sensical responses to free response survey questions (Example: respondent identified gender as "attack helicopter" and citizenship as "Banana Republic.")

Results

ANOVA results indicate statistically significant differences in two of the four SB factors for the dependent variable average number of credit hours per semester. I found significant p-values for both One-way ANOVAs of *perceived peer support factor* and *perceived isolation factor*. ANOVAs for perceived classroom support nor perceived faculty support resulted in statistically significant differences based on average number of credit hours per semester. Table 6 summarizes all ANOVAs related to SB factors and the independent variable average number of credit hours per semester.

Table 6

Sense of Belonging Factor by Credit Hour ANOVAs

	R^2	DF	F ratio	p-value
Perceived Peer Support Factor	.106252	3	16.524	<.0001
Perceived Classroom Support Factor	.014484	3	2.0429	.1072
Perceived Isolation Factor	.064262	3	9.5459	<.0001
Perceived Faculty Support Factor	.008666	3	1.2151	.3038

Perceived Peer Support Factor

A one-way ANOVA on the dependent variable perceived peer support produced statistically significant results ($R^2 = .106, DF = 3, F\ ratio = 16.525, p = < .001$). Table 7 summarizes frequencies Means, Std Dev, and Std Err. These findings suggest that the number of average credit hours per semester had a slight influence ($R^2 = .106$) on graduate students' perception of peer support, one of four constructs contributing to SB.

Table 7

ANOVA Perceived Peer Support

	Frequencies	Mean	Std Dev	Std Err
3 or less	27	2.9398148	1.0954289	.18849
4-6	93	3.1021505	1.1257465	.10156
7-9	155	3.858871	.8857995	.07867
10+	146	3.7285959	.9518991	.08106

After receiving a significant *p-value* for the ANOVA on perceived peer support, I ran a Tukey-test to determine statistically differences between the categories within the independent

categorical variable – average number of credit hours per semester. The Tukey-test showed that 3 or less ($M = 2.94$) and 4-6 ($M = 3.10$) were significantly different from 7-9 ($M = 3.86$) and 10+ ($M = 3.73$) in a Connecting Letters Report (Table 8). An Ordered Differences Report (Table 9) showed a statistically significant difference among all levels within the independent variable (average number of credit hours per semester), with the exception of 4-6 and 3 or less, and 7-9 and 10+. This result further validated the Connecting Letters Report.

Table 8

Connecting Letters Report, Perceived Peer Support

Level	Letter	Mean
7-9	A	3.8588710
10+	A	3.7285959
4-6	B	3.1021505
3 or less	B	2.9398148

Table 9

Ordered Differences Report, Perceived Peer Support

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
7-9	3 or less	0.9190562	0.2042474	0.392209	1.445903	<.0001*
10+	3 or less	0.7887811	0.2051792	0.259530	1.318032	0.0008*
7-9	4-6	0.7567204	0.1284657	0.425349	1.088092	<.0001*
10+	4-6	0.6264454	0.1299420	0.291266	0.961625	<.0001*
4-6	3 or less	0.1623357	0.2141094	-0.389950	0.714622	0.8731
7-9	10+	0.1302751	0.1129560	-0.161090	0.421640	0.6566

Perceived Isolation Factor

A one-way ANOVA on the dependent variable perceived isolation produced statistically significant results ($R^2 = .064, DF = 3, F\ ratio = 9.5459, p = < .001$). Table 10 reports and summarizes frequencies, means, Std Dev, and Std Err Means. These findings suggest that the number of average credit hours per semester had a slight influence ($R^2 = .064$) on graduate student's perception of their isolation, one of four constructs contributing to SB.

Table 10

ANOVA Perceived Isolation Factor

	Frequencies	**Mean**	**Std Dev**	**Std Err**
3 or less	27	3.50000	1.0143205	.204108
4-6	93	3.31183	1.1208595	.11002
7-9	155	2.67742	1.0502658	.08522
10+	146	2.89897	1.0412107	.08781

After receiving a significant p-value for the ANOVA on perceived isolation, I ran a Tukey-test to determine statistically significant differences between the categories within the independent categorical variable – average number of credit hours per semester. The means (M) for 3 or less ($M = 3.50$) and 4-6 ($M = 3.31$) were significantly different from 7-9 ($M = 2.68$) and 10+ ($M = 2.89$) in a Connecting Letters Report (Table 11). An Ordered Differences Report (Table 12) verified the Connecting Letter Report and found a statistically significant difference among all levels within the independent variable, with the exception of 4-6 and 3 or less and 7-9 and 10+.

Table 11

Connecting Letters Report, Perceived Isolation

Level	Letter	Mean
7-9	A	2.6774194
10+	A	2.8989726
4-6	B	3.3118280
3 or less	B	3.5000000

Table 12

Ordered Differences Report, Perceived Isolation Factor

Level	-Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
3 or less	7-9	0.8225806	0.2212542	0.251865	1.393296	0.0013*
4-6	7-9	0.6344086	0.1391625	0.275445	0.993372	<.0001*
3 or less	10+	0.6010274	0.2222636	0.027708	1.174347	0.0358*
4-6	10+	0.4128554	0.1407618	0.049766	0.775944	0.0185*
10+	7-9	0.2215532	0.1223615	-0.094073	0.537179	0.2697
3 or less	4-6	0.1881720	0.2319375	-0.410101	0.786445	0.8491

Demographic Trends for Part-Time Graduate Student Sense of Belongingness (Multiple Regressions)

I used multiple regression analysis to determine if various demographic characteristics predict or correlate with part-time graduate student SB. For the purposes of this phase of analysis, I defined *part-time graduate students* as respondents who reported an average credit hours per semester enrollment of 3 or less or 4-6 ($n = 120$). Based my follow up interviews with

some participants in the survey, there is a likelihood that not all students in this sample accurately self-identified as part-time graduate students. Some students who identified as taking 3 or less or 4-6 credit hours a semester during the survey then identified themselves as full-time graduate students in a follow up interview. I discuss this limitation at more length in a subsequent section.

I conducted predictive modeling to determine if the independent variables *Gender Identity*, *Race & Ethnicity*, and or *Citizenship* could predict any of the four constructs associated with graduate student SB. The resulting model found no statistically significant predictive relationship between gender ($p = 0.114$), race & ethnicity ($p = .179$), or citizenship ($p = .245$). After I conducted these simple and multiple linear regressions for these three demographic categories which resulted in no statistically significant p-values, I examined *GPA* and *number of semesters enrolled* as independent variables.

A multiple linear regression for GPA and number of semesters enrolled produced a statistically significant p-value for GPA ($p = .016$). Number of semesters enrolled did not predict of SB within the model. Within the model GPA predicted two SB factors, perceived faculty support ($p = .016$) and perceived classroom support ($p = .030$). Finally, I examined respondent's *campus affiliation* and *student organization involvement* as predictors of SB using a simple linear regression. The model produced a significant p-value (.001) for campus affiliation correlation with perceived peer support factor, but campus affiliation did not predict the other three constructs with the model. Student organization involvement also predicted perceived peer support ($p = .008$) but did not have a significant influence on any of the other three constructs.

Findings

My analysis of participant responses to the survey provided partial answers to the study's research questions. In response to the research question, to what extent does SB matter to part-time graduate students, data analysis produced three related findings. First, Hoffmann et al.'s (2002) existing framework for measuring SB may have limited applicability to part-time graduate students. Part-time enrollment for graduate students (3 or less – 4-6 average credit hours per semester) did not predict overall SB. I explain this finding by either the framework's inability to describe and measure SB in ways that make sense to part-time graduate students, or a general lack of value placed on SB by part-time graduate students. Part-time status predicted two of the four constructs associated with SB, perceived isolation and peer support, despite not predicting overall SB within the model. This suggests that SB does matter to part-time graduate students to some extent, and perhaps Hoffmann et al.'s (2002) framework did not effectively describe the SB factors classroom support and faculty support in ways that connected to the experiences of part-time graduate students.

Second, an analysis of the two SB factors which did have statistically significant relationship with part-time student status, perceived isolation and perceived peer support, provides insight into the relationship between average course load and SB. Student's perceived isolation generally decreased as the number of credit hours increased. With the exception of graduate students who reported taking 10+ credit hours per semester, who reported higher levels of isolation than students who reported taking 7-9 credit hours per semester. High course loads taken by PhD students engaged in independent research endeavors or master's students expediting their studies may explain this trend. Both populations are less likely to engage with their peers because of their academic goals – and would predictably report higher levels of

isolation. Most importantly this finding suggests that part-time graduate students who take more than 3 credit hours a semester are less likely to report isolation from peers.

Third, the trends and findings associated with perceived peer support validate findings related to perceived peer isolation in that they reveal a natural inverse relationship – as perceived isolation decreases perceived peer support increases. Unlike perceived isolation, perceived peer support did not decline for students enrolled in 10+ credit hours a semester. The relationship between both factors and part-time graduate students enrolled in 3 or less credit hours a semester suggests these students are at the greatest risk of feeling disconnected from the university.

To addresses this study's second research question, what factors and outcomes are associated with SB for part-time graduate students, I examined demographic categories and other information provided by participants to draw conclusions. Statistical analysis of demographic categories including race & ethnicity, gender identity, and citizenship for part-time graduate students found that none of these categories had statistically significant relationships with SB constructs. The survey instrument relied on an inclusive methodology to collect demographic information – but this inclusivity also complicated statistical analysis. Within in the sample of part-time graduate students, gender identity included 8 categories, citizenship 7 categories, and race & ethnicity 8 categories. Dividing a relatively small sample (n=120) three ways with 23 different categories complicated the ability to produce statistically significant analysis.

When statistical analysis revealed that the demographic categories of gender identity, citizenship, or race and ethnicity did not predict SB for part-time graduate students – I examined alternative demographic categories drawn from the survey questions including GPA, number of semesters enrolled, campus affiliation, and student organization involvement. Within the statistical model GPA predicted perceived faculty support and classroom support. As part-time

graduate student's self-reported GPA increased, their self-appraisals of faculty support and classroom support also increased. Part-time graduate student status alone did not predict these two factors, but when I combined part-time student status and GPAs greater than 3.5 in a model, they did predict higher levels of perceived faculty and classroom support. This finding suggests that an increase in graduate student SB may also lead to an increase in academic success as measured by student's GPA. Alternatively, academically successful students simply perceive support from faculty and within the classroom based on their grades – regardless of to what extent support exists.

Finally, I examined campus affiliation and student organization involvement as a variable related to SB for part-time graduate students. My analysis suggested that there is some relationship between these factors and SB, yet like other variables discussed above a single variable did not predict SB across all four factors. Campus affiliation and student organization involvement did not predict perceived faculty and classroom support but did have a statistically significant relationship with perceived peer support. Part-time graduate students who reported involvement in student organizations also reported higher levels of peer support. This finding suggests that student organization involvement did influence graduate student's SB and connectedness to peers. Campus affiliation also predicted perceived peer support for part-time graduate students. Respondents with a primary affiliation with the university's main campus reported higher mean peer support scores ($M = 3.73$) than students affiliated with satellite campuses ($M = 3.07$) or students 100% online ($M = 2.59$).

Discussion

Despite prior researchers who found a predictive relationship between Sb and demographic categories of gender, race, or ethnicity (Dueñas & Gloria, 2017; Hurtado & Carter,

1997; Le et al., 2016; Strayhorn, 2019; Vaccaro & Newman, 2016) I found no such relationship among part-time graduate students in this study. This study's sample population, a diverse sample of graduate students across disciplines and enrollment-levels, is one explanation for the lack of alignment with prior research within sample population. Due to the small number of participants who identified with certain demographic categories (Examples: *Middle Eastern or North African* (n=10), *Citizenship – Bangladesh* (n=5), and *affiliation with coastal satellite campus* (n=4) the sub-samples of demographic groups may not represent the broader demographic population, thus complicating analysis.

I identified parallels between existing scholarship on SB for graduate students in general and the findings within this study. Pascale (2018) found that SB for graduate students differed compared to student's undergraduate experiences. This study found that SB was important but different for part-time graduate students, validating findings by Pascale (2018). Further investigation of SB for part-time graduate students should consider advisor support and professional relationships as factors which may contribute to SB based on research conducted by Curtin et al. (2013) and O'Meara et al. (2017). New research instruments need to incorporate questions related to advisor support and professional relationships to determine if they also contribute to SB for part-time graduate students.

As highlighted in the introduction, there is virtually no scholarship on SB for part-time graduate students. This study addresses that gap by laying a foundation for future research. The findings suggest that existing SB frameworks (Hoffman et al., 2002; Hurtado & Carter, 1997; Strayhorn, 2019) may require modification when applied to part-time graduate students. Additionally, research instruments based on these revised frameworks may yield new insights related to SB for part-time graduate students.

Limitations

The limitations of this study and its findings include (a) reliance on a single site sample of graduate students, (b) potential inclusion of full-time graduate students within part-time sample, and (c) the unknown influence of COVID-19 and program delivery modifications on respondent's experiences. I recommend additional research across multiple institutions to validate and provide context to the findings of this single-site study. Student's self-identification or misrepresentation of their status as part- or full-time graduate students also limits applications of findings. Finally, I collected this survey data in 2021 more than a year after the start of the COVID-19 pandemic. When asked within the study "To what extent has the COVID-19 Pandemic impacted your response to the previous ratings and questions?" 37% of part-time graduate students responded, "Not at all." Therefore, the pandemic impacted SB for almost two-thirds of students surveyed.

Implications for Practice

Despite the aforementioned limitations, these findings do have implications for practice and supporting part-time graduate students. First, the demonstrated relationship between part-time enrollment, low self-appraisals of peer support, and high self-appraisals of isolation – leads me to conclude that part-time students are less likely than their full-time peers to report high-levels of SB. Practitioners can use this insight to develop programs and interventions for part-time graduate students to specifically target isolation and connection to peers. Gender identity, citizenship, and race & and ethnicity's lack of influence on any of the four SB constructs for part-time graduate students suggests that these demographic categories do not influence SB for part-time graduate students. This finding needs further investigation, but in the meantime, practitioners can focus on providing support and interventions to part-time graduate students as a

whole – rather than focusing in on one demographic sub-group within this population. Finally, these findings suggests that part-time graduate students' academic success, measured by cumulative GPA, correlates positively with SB. More specifically, institutions should focus on fostering faculty and classroom support for part-time graduate students to increase both SB and academic success.

Recommendations for Future Research

Future studies should attempt to replicate findings with a multi-institutional sample of part-time graduate students. A multi-institutional study of part-time graduate student SB would either validate the above findings or challenge these findings through more robust analysis and diverse samples. Additionally, I recommend conducting similar research in 2-3 years when impacts of the COVID-19 pandemic on student experience have normalized or ended. A second benefit of study replication is a comparison on the impact the pandemic had on graduate student SB. In future studies of part-time graduate student SB I recommend alternative methods to identify an accurate part-time student sample and simplify analysis.

I conducted follow-up interviews with 16 study participants, four of whom incorrectly self-identified as part-time students based on average number of a credit hours per semester. These four participants were PhD students and did not include their research credit hours in their estimation of average credit hours per semester. In follow-up interviews these students described a student experience akin to that of part-time graduate students. I determined that PhD students working full-time on research while taking 1-2 academic courses per semester were comparable to part-time graduate students who also worked full-time jobs outside of the university. Future research may also exclude PhD students altogether to avoid this confusion.

Finally, the relative value that part-time graduate student place on SB is still unclear. While there is some evidence within this study to suggest that factors associated with SB are linked to higher GPAs for part-time graduate students, SB may neither predict academic success nor be of value to the sample population. Future research should examine how SB relates to retention of part-time graduate students and if part-time graduate students place a value on the construct of SB, regardless of its potential positive outcomes.

Conclusion

This study fills a gap in the existing body of SB scholarship and adds to the timeline of SB research I presented in the literature review by further extending the exploration of SB with diverse populations. Where I could not locate academic scholarship on SB for part-time graduate students, this study provides a foundation for further investigation by myself and other researchers. SB scholarship has evolved significantly since the 1990s and this study contributes the evolution of scholarship and application of SB theories by examining a new sample population – part-time graduate students.

The extent to which SB matters to and for part-time graduate students, this study's first research question, remains unclear. Findings suggest that greater academic success correlated with two SB factors – faculty and classroom support. This study did not examine correlations between retention and persistence and SB, further investigation is needed to determine if SB matters for the academic success and satisfaction of part-time graduate students. The extent to which SB mattered to part-time graduate students individually is difficult to measure through a survey instrument. The follow-up interviews conducted in conjunction with this research study, but addressed in a follow-up paper, may provide further insight into the value that part-time graduate students place on SB.

Regarding the second research question, what factors or outcomes are associated with SB for part-time graduate students, I found that part-time enrollment predicted both perceived peer support and perceived isolation. Part-time enrollment did not however predict perceived faculty support or perceived classroom support. Within the sample of part-time graduate students, self-reported GPA correlated with perceived faculty support and perceived classroom support. Demographic variables including gender, race, and ethnicity did not predict SB within the model for part-time graduate student SB. Together these findings suggest that SB does matter for part-time graduate students and correlates with academic success. However, existing research instruments, such as Hoffman et al. (2002), may need revision to accurately describe faculty support and classroom support within the context of graduate education.

The support of part-time graduate students, and part-time adult learners in general, is of importance to all institutions of higher education. Even more so for land-grant universities who seek to supplement their shrinking or stagnate enrollments through the addition of new graduate programs designed for working professionals. This study provides insights to practitioners who seek to support these students, and caution to administrators who might assume that fostering SB for part-time students is of no concern or challenge. Finally, and perhaps most importantly, this study opens the door for a new line of inquiry in SB scholarship – providing direction and insights to future researchers.

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Chapter Five: Conclusion

Introduction

This research prepares land-grant institutions for future challenges; challenges which lie beyond the horizon and are rarely addressed in short-term strategic plans. Anticipating and preparing for future challenges and realities specific to U.S. four-year public land-grant institutions requires a consideration of university industry partnerships (UIPs), increases in research productivity, and additional support for part-time professional students. Few scholars in higher education direct their attention towards these specific issues and their connection to future challenges which may disrupt or force the current model of higher education to evolve dramatically.

Each of the three independent articles within this dissertation provide insight to leaders in higher education navigating disruptions and the evolution of the U.S. research university model. UIPs are one mechanism through which higher education can respond to the looming and future financial and confidence crises. UIPs offer real world application opportunities to researchers, revenue-generation opportunities to administrators, job-opportunities to current students, and communicate the economic importance of universities to the public. In the first of this three-article dissertation, I conducted a systematic literature review to assist institutions in the pursuit of such partnerships. Within that review, I asked the questions: how are UIPs structured and what organizational structures and strategies are most likely associated with positive outcomes?

Research productivity is core to the mission of land-grant institutions and important because of its broader impacts on society and capacity to generate revenue. Land-grant universities must continue to pursue their missions of research and service to remain competitive in the evolving landscape of higher education. As costs rise and direct federal and state funding decreases, university leadership can turn to the research enterprise to generate revenue and offset

operational costs. Therefore, in the second dissertation article I designed policy analysis and leveraged hermeneutical IPA methodologies to answer the question: how do institutional policies influence research productivity at Clemson University, a land-grant R1 Carnegie Classified institution?

Historically, land-grant institutions catered to residential undergraduate students aged and full-time graduate students pursuing research degrees. Given models which project a decline in traditional-age college student enrollment, accompanied by an increase in the need for current degree-holding professionals to up-skill or re-skill – land-grant institutions must reexamine how they engage part-time students. For the final chapter of this three-article dissertation I developed a survey-based study, relying on previously validated measures of SB, to answer the questions: to what extent does SB matter for part-time graduate students, and what outcomes are associated with SB for part-time graduate students? Together these three realities – the need for UIPs, increased research productivity, and support for part-time professional graduate students – and their associated research questions provide insights for land-grant universities, practitioners, and leaders in higher education who are preparing for future possibilities and realities today.

Theoretical Contributions

Triple Helix

Many scholars have built upon and applied Etzkowitz and Zhou's (2018) Triple Helix Theory in their research. However, much of this research occurs within the field of economics and urban development and is not readily accessible or comprehensible to scholars in higher education. This dissertation supports the further application of the Triple Helix theory to questions and concerns of educational leadership and higher education. While this study focused primarily on the interaction between two strands of the helix – universities and industry, a clearer

understanding of how these two strands interact and structure their relationships should assist practitioners to engage with government, the third component of the Triple Helix. Much of the literature surrounding the Triple Helix theory is either theoretical or takes a macro-view of university-industry interaction. This research provides a micro-application of the Triple Helix and introduces the theoretical underpinnings to new audiences.

Complex Adaptive Systems

This research further advances our understanding of how institutions of higher education function as Complex Adaptive Systems (CAS). The findings presented in Chapter 3 and the hermeneutical interpretative policy analysis of university research policies reveal how these organizations operate as CAS in matters of policy creation and implementation. A university which operates as an effectively chaotic CAS can increase research productivity through policy changes. When these policy changes are followed by action and investment, anticipated consequences, and permeation of communication and messaging research productivity increases. The analysis in Chapter 3 revealed that the case institution did practice CAS in its distribution of responsibilities across the organization and use of complex, autonomous, yet synergistic units dedicated to support the research enterprise.

Sense-of-Belonging

This research contributes to an emerging student development theory and area of research by applying existing theoretical frameworks and validated tools to a new population – part-time graduate students. The findings presented in Chapter Four provide a foundation for further inquiry related to SB and part-time graduate students. The findings suggest that part-time graduate students are less likely to report high self-appraisals of SB than their full-time peers. Additionally, whereas prior research indicated race and gender influence SB in studies with other

sample populations – namely full-time undergraduate students (Dueñas & Gloria, 2017; Hurtado & Carter, 1997; Le et al., 2016; Strayhorn, 2019; Tachine, et al., 2017; Vaccaro & Newman, 2016); race, gender, ethnicity, nor citizenship influenced SB for part-time graduate students. These findings provide a foundation for further inquiry on links between SB and retention of part-time graduate students along with the self-appraised value of SB for this population. If further inquiry addresses these questions, future scholars can modify existing SB theories and develop new theoretical lenses to better understand the importance of SB for part-time graduate students.

Insights for the Future of Land-grant Institutions

Chapter Two: Systematic Literature Review

The findings presented in the systematic literature review of UIPs structuring practices provide several insights and implications for land-grant universities seeking to prepare for future challenges. First, by design the systematic literature review serves as a useful synthesis of current best practices for land-grant administrators. The study also responds to Livingstone's (2009) question "which organizational structure" and "what is the best mechanism" for effective industry partnerships (p. 74-75) by identifying common practices to structure UIPs.

Land-grant universities that have yet to invest in or build significant capacity for UIPs should try multiple approaches to structure UIP and experiment with strategies that fit the institution and UIP mission. Such strategies should at minimum include a clear goal or objective and allow for flexibility. Universities should promote horizontal rather than vertical organization structures for UIPs. Leaders of UIPs should also foster the principles reflected within CAS – especially decentralized decision making – when developing UIP structures.

Land-grant administrators, faculty, staff, and students should all view themselves as potential players in the development, structuring, and success of UIPs. Because I did not find significant variance of UIP structuring practices among national settings – land-grant universities should feel free to adopt practices beyond those in use at other U.S. peer-institutions.

Because UIPs are structured by time spent in meetings and events, land-grant universities should consider how they can use their respective networks of facilities, campuses and extension offices to facilitate events and meet with industry partners. Additionally, many of the events and activities already established on land-grant campuses can serve as engagement opportunities for UIPs. Alternatively, events sponsored by UIPs and held on campus can serve faculty and students not directly involved with the partnership.

Before pursuing any UIP or coordinated effort to increase UIPs across the institution, university leaders should expect a significant time commitment on behalf of all parties involved in the proposed partnership. If the capacity to support large broad scale UIPs does not already exist at the institution or within the university unit looking to establish a partnership, leaders should table such partnerships until internal support systems are in place. Because of the significant time investment involved in developing, structuring, and maintaining UIPs – it is a waste of vital resources to pursue such partnerships without the prerequisite knowledge and support in place.

Finally, land-grant universities that view UIPs as one way to prepare for and address future challenges should not fear failure. Administrators can frame an UIP as a success – even if the stated goals and objectives are not achieved. Within the literature, I noted numerous examples where UIP leaders did not achieve, abandoned or modified the initial goal – yet the UIP did lead to other positive outcomes.

Chapter 3: Policy Analysis

The selection of a land-grant university as the research setting and case for the hermeneutical IPA study in Chapter Three facilitates direct application of the findings this study's overarching research problem – how can land-grant universities prepare for the future beyond the short-term strategic plans. While not all research policies are transferable from one land-grant university to another, the themes and findings presented in Chapter Three should apply universally to land-grant universities. Below I briefly summarize the themes presented in Chapter Three and highlight specific implications for land-grant universities.

Action and Investment

Despite the limitations to predict the future or control external events, land-grant universities are self-governing bodies who – with the support of their governing boards – can invest in and act to increase research productivity through policy. As public institutions, land-grant universities are already in the practice of responding to and interpreting federal and state policies that influence the research enterprise. If a strategic decision is made to increase research productivity, the same individuals involved in updating and crafting policies in response to external oversight can facilitate a process based on internal directives and priorities.

The findings presented in Chapter Three also support the decision to hire new leadership, create new support units, and develop seed grant programs to increase research productivity. Universities should avoid the simultaneous pursuit of all three or approach with caution. The case institution used within Chapter Three demonstrated these effective behaviors over a span of five years. Land-grant universities under financial constraints should take these steps gradually. Smaller land-grant universities can use success stories at other institutions as both templates and rationales for additional investment.

Consequences

The theme of intended and unintended consequences presented in Chapter Three has unique implications and challenges for land-grant universities. The first consequence of increased research productivity – an emphasis on STEM research and disciplines, could pose a challenge for land-grant administrators. University leaders pursuing increased research productivity through policy change, actions, and investment should carefully consider the impact such steps will have on departments and programs across the institution. If academic departments in the humanities and social sciences are already experiencing strain due to declining enrollments and public criticism – additional investment and support of activities largely pursued by STEM disciplines will only further exacerbate these challenges. Conversely, STEM programs and departments struggling to compete for students and research funding with their peers may benefit from a concerted effort to increase research productivity university wide. Finally, an emphasis on research productivity and policy implementation may also negatively impact progress, accountability, and compliance in other matters of policy including but not limited to (a) diversity, equity, and inclusion, (b) Title IX, and (c) college athletics.

Research is but one component of the tripart-mission of land-universities. Before administrators dawn *research-colored glasses* through which to view every challenge and opportunity, they should carefully consider how to balance the missions of research, teaching, and service. If research policies and priorities are not clearly connected to the university missions of teaching and service, the disconnect may lead to declines in enrollment and further disconnect between the institution and community. The pursuit of all three components of the land-grant mission is essential to the relevance and survival of land-grant institutions. The case institution in Chapter Three made explicit attempts to connect research to other university priorities including

teaching, student life, and community engagement. This approach is one measure to prevent a disconnect between the components of the mission, while making a concerted effort to invest in one area.

Communication

The findings presented in Chapter Three reveal how university messaging communicated research policies and promoted research productivity. Land-grant university leaders and administrators should consider how they will coordinate messaging related to research productivity through their large complex organizations; organizations which are defined by decentralized decision making and academic freedom. Because strategic communication plans are rarely public documents, I discovered no such documents during the data collection phase of the study in Chapter Three. The coordinated and consistent messaging related to the research enterprise suggests however that such an internal plan existed at the case institution. University leaders who are pursuing a strategic investment in and expansion of the research enterprise should work with an external consultant, or internal subject-matter experts, to develop a comprehensive communication plan. Such plans should consider policy and priority announcements as well as how multiple university units can coordinate messaging over the long-term.

Chapter Four: Sense of Belonging

The findings presented in Chapter Four offer guidance to land-grant university leaders seeking to provide support to or increase enrollment of part-time graduate students. The results indicate that understanding, measuring, and facilitating SB for part-time graduate students is not straight forward. First, it remains unclear what degree of importance part-time graduate students place on SB. The finding that part-time graduate students with higher self-appraisals of faculty

and classroom support also have higher GPAs, does suggest that part-time graduate students might value SB if it does have a relationship with academic success. Second, it is unclear if existing frameworks can accurately measure SB for part-time graduate students. The existing body of knowledge may need revised frameworks or new approaches. Finally, the process of fostering SB for part-time graduate students who spend little time on campus, or no time at all, remains unclear. The findings presented in this study suggest that a connection to a university's main campus and involvement in student organizations correlate with higher SB for part-time graduate students.

Historically, land-grant universities have catered to and support full-time undergraduate and graduate students under that age of 30. Land-grant universities that have successfully facilitated SB for these students should not assume that those same practices and strategies will translate to SB for part-time graduate students. Additional research and follow up interviews with part-time graduate students who report high levels of SB may provide additional insights into the strategies which facilitate SB for this population.

Land-grant universities seeking to capitalize on satellite campuses and online learning to expanded graduate programs and increase enrollment of part-time graduate students should acknowledge the lack of reported SB for those students within this study. If existing best-practices are not embedded at the institution to support part-time graduate students at the university, universities, colleges, and departments need to build capacity in advance of enrolling large numbers of new part-time graduate students.

Conclusions

Limitations

This study follows in the tradition of *future studies* and the writings of Alexander (2020), Ambrose and Wankel (2020), Crow and Dabars (2015), and Gavazzi and Gee (2018) who each challenged scholars, leaders, and practitioners to consider the future of higher education and its challenges. Our human inability to predict the future with precision inherently limits this form of scholarship – but makes it no less important. While there are many, and will always remain, many unknowns – we must learn from our history and draw on statistical modeling to prepare for our uncertain future.

The findings presented within this dissertation are also limited in both scale and scope. The systematic literature review filled a gap in the literature and provided guidance to practitioners yet the lack of scholarship providing detail or transparency regarding the structure of UIP limits its application. The policy analysis of university research policies which foster research productivity benefited from a successful case institution, but its subjective and interpretivist research methodologies limit broader application. Finally, the quantitative study of SB and part-time graduate students expands the body of knowledge related to general SB in higher education and in doing so its findings are limited by the lack of complimentary research. Despite these limitations, the broader contributions of this research are significant and of value to both scholars and practitioners.

Recommendations

I invite other scholars, leaders, and practitioners in higher education to join me in the pursuit of future studies, fundamental, and applied research to prepare for the year 2050 and beyond. Scholars have devoted great attention UIPs, their complex challenges, and unique

opportunities. However, as scholarship evolved in this domain, researchers neglected fundamental and practical research to inform basic UIP practices. As a community of scholars concerned with the value of UIPs for the enterprise of higher education – we must continue to pursue and publish research to support all levels of practices and experience with UIPs. Land-grant universities should both engage in and consume scholarship related to UIPs because of the potential value of these partnerships to support institutional missions.

The research university is an essential component of the American higher education model. U.S. higher education emerged as the premier provider of education and facilitator of research in part because of the robust and successful research enterprises of U.S. private and public universities. As international competition increases and other nations replicate and adopt the U.S research university model world-wide, U.S. research institutions of all types must adapt and improve efficiency to remain competitive and relevant. The health and expansion of the research enterprise is especially important for land-grant universities who must simultaneously balance teaching and service missions.

The findings presented in this study suggest that any land-grant university can increase research productivity through effective policy implementation. Scholars should build on the findings within this dissertation to validate best practices regarding research policy and increased productivity. Simultaneously, land-grant university administrators should review existing research policies, revise and craft new policies as needed, and build research capacity through investments in personnel and programs.

As U.S. birth rates decline and international students pursue a U.S. higher education with less frequency (Alexander, 2020; Ambrose & Wankel, 2020; Grawe, 2021), U.S. institutions of higher education must reevaluate their enrollment management strategies. Land-grant

universities, who historically depended on tuition revenue from undergraduate students and more recently on international graduate student tuition (Grawe, 2021), should consider how they will adjust or supplement enrollment-based revenue in the future. As other student populations decline, land-grant universities may turn to part-time domestic graduate students to reinforce overall enrollment. The findings presented with this dissertation suggest that fostering SB for part-time graduate students is important and correlated with academic success. However existing measurements of SB appear in capable of accurately measuring or describing factors associated with SB for part-time graduate students. Scholars should build on these findings to develop new frameworks and scales to measure SB in terminology that relates to the experiences of part-time graduate students. Meanwhile, practitioners who support part-time graduate students should acknowledge the same strategies and experiences which foster SB for full time undergraduate and graduate students may not be effective for part-time graduate students.

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Appendix A

Checklist of items to include when reporting a systematic review or meta-analysis (Moher et al., 2009)

	#	Checklist item	Reported on page #
Title			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
Abstract-Structured Summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
Methods			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., webaddress0, and if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and data last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in the systematic review, and if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any process for obtaining and confirming data from investigators.	

Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.
Results		
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage ideally with a flow diagram.
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome-level assessment (see Item 12)
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group and (b) effect estimates and confidence intervals, ideally with a forest plot.
Synthesis of results		Present results of each meta-analysis done, including confidence intervals and measures of consistency.
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).
Discussion		
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., health care providers, users, and policy makers).
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review level (e.g., incomplete retrieval of identified research, reporting bias).

Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.
Funding		
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.

Appendix B

Sense of Belonging Scale

For the following select from the following options: Completely True (1); Mostly True (2); Untrue (3); Mostly Untrue (3); and Completely Untrue (5).

1. Speaking in class is easy because I feel comfortable.
2. I feel comfortable volunteering ideas or opinions in class.
3. I feel comfortable asking a question in class.
4. I feel comfortable contributing to class discussions.
5. It is difficult to meet other students in class.
6. I know very few people in my classes.
7. I rarely talk to other students in my classes.
8. No one in my classes knows anything personal about me.
9. I have discussed personal matters with student who I met in class.
10. I incite people I know from class to do things socially.
11. I have developed personal relationships with other students in class.
12. I discuss events which happen outside of class with my classmates.
13. If I miss class, I know students who I could get the notes from.
14. Other students are helpful in reminding me when assignments are due or when tests are approaching.
15. I could call another student from class if I had a question about an assignment.
16. I have met with classmates outside of class to study for an exam.
17. I feel that a faculty member would take the time to talk to me if I needed help.
18. I feel that a faculty member would be sensitive to my difficulties if I shared them.
19. I feel that a faculty member would be sympathetic if I was upset
20. I feel that a faculty member really tried to understand my problem when I talked about it.
21. I feel comfortable asking a teach for help if I do not understand course-related material.
22. I feel comfortable seeking help from a teacher before or after class.
23. If I had a reason, I would feel comfortable seeking help from a faculty member outside of class time (i.e., during office hours, etc.)
24. I feel comfortable asking a teacher for help with a personal problem.
25. I feel comfortable socializing with a faculty member outside of class.
26. I feel comfortable talking about a problem with faculty.

For the following statements rate your degree of affiliation. (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, (5) strongly agree

1. I feel connected to Clemson University
2. I feel connected to my college
3. I feel connected to my department
4. I feel connected to my program

I feel most affiliated with

- Clemson University
- my college

- my department
- my academic program

Demographic Questionnaire Section:

Gender
- male
- female
- trans
- prefer not to answer

Race & Ethnicity
- White
- Black or African American
- Hispanic or Latinx
- Asian
- Pacific Islander
- Native American
- Biracial
- Other

Citizenship
- US citizen
- non-US citizen

Semesters enrolled
- 1
- 2
- 3
- 4+

GPA [free response]

number of credit hours per semester
- 3 or less
- 4-6
- 7-9
- 10+

Program delivery method
- In-person
- 100% online
- Hybrid

College affiliation
- CECAS
- COB
- COE

On which campus/es do you attend classes (select all that apply):
- Clemson, SC – main campus
- Greenville, SC – CUICAR

- Greenville, SC – Greenville ONE
- Greenville, SC – Prisma Health Campus
- Charleston, SC – Zucker Family Graduate Education Center
- Charleston, SC – MUSC Downtown Campus
- none/100% online learner

Are you involved in any student organizations?

- yes
- no