RESEARCH ARTICLE

WILEY

Managing campus entrepreneurship: Dynamic capabilities and university leadership

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Much has been written about university–industry partnerships, but relatively little research has focused on the effects of such collaboration on conflict among university departments or on broader types of entrepreneurial behavior involving local, regional, and even global initiatives. This broader perspective, which we call "campus entrepreneurship," offers more avenues for universities to establish a foundation for long-term success at a time when public support for higher education appears to be in decline. The dynamic capabilities framework and leadership theory developed in the fields of strategic management and organizational behavior, respectively, are applied herein to provide guidance to university leaders seeking to embrace a comprehensive multifaceted entrepreneurial approach to campus priorities and activities.

1 | INTRODUCTION

Campus entrepreneurship—by which we refer to creating value through a range of entrepreneurial activities (e.g., technology and skill-related transfers from a university to the wider economy and engagement with external partners) and capturing value from those activities—has landed firmly on the agenda of campus leaders due to student interest and engagement by external stakeholders. The topic has long appealed to scholars interested in technology transfer (e.g., Link, Siegel, & Wright, 2015). New types of entrepreneurial activities undertaken by students and faculty can provide additional resources for campus research and teaching, help energize regional and national economies, and raise a university's positive public profile. However, such entrepreneurial activities pose issues that require policies and structures to increase beneficial spillovers within the university and to regional and national ecosystems. Put different, for entrepreneurship and technology transfer to be most beneficial, they must be embedded in a coherent campus management and policy framework.

Campus entrepreneurship, when in full blossom, is replete with interdependencies that require campus leadership to think, and act coherently, in systems terms, about the strategic management of entrepreneurial activities on campus and in partnership with external entities. Effective strategic management has a long-term orientation and focuses on allocating resources to activities that are opportunity rich in terms of research, teaching, and potential economic and social impacts. Academic entrepreneurship, when governed directly and properly, can be a basis for competitive advantage that contributes to the evolutionary fitness of universities that engage in it.

For research universities in particular,[1] collaboration with industry can provide valuable new sources of funding, real-world experiences for students, and future careers for graduates. However, such collaboration can also generate conflicts of interest that must be managed. The effective management of campus entrepreneurship is light handed, opportunity focused, and characterized by the creative, adaptive orchestration of campus resources and campus constituencies. It also addresses stakeholder concerns, preserves independence, and enhances academic and professional standards.

The primary goal of this study is to improve our understanding of campus entrepreneurship based on an inductive analysis of qualitative accounts gathered from historical, academic, and archival material, including local press sources and interviews with former presidents at Stanford University, Yale University, and the University of California, Berkeley (UC Berkeley). Our review of the literature indicates that little has been written on campus entrepreneurship from a dynamic capabilities perspective.[2] Dynamic capabilities involve high-level processes that can enable an organization to direct its resources and activities toward high-payoff endeavors. We believe the framework can serve as a useful

tool to help guide campus entrepreneurship. The strategic management of universities is at an early stage of development; hence, there is much to be learned by identifying causal factors influencing the relationship between campus entrepreneurship and university performance.

To achieve this objective, we take a holistic approach to campus entrepreneurship that goes beyond well-documented examples of technology transfer and startup launch pads. We first survey the traditional academic entrepreneurship literature and then describe in more detail contemporary academic entrepreneurship. We then propose and describe a dynamic capabilities approach to campus entrepreneurship. Finally, we develop a set of propositions drawn from this approach to guide future empirical research on this topic.

2 | TRADITIONAL CAMPUS ENTREPRENEURSHIP

Historically, much attention paid to academic entrepreneurship has focused on research partnerships and the commercialization of technology through patent licensing and technology transfer, typically managed through a university's technology licensing office. Such research highlights different factors and makes various arguments about why one or another factor is important in explaining strong or weak performance in university technology transfer.

Studies include those on the impact of the involvement of star scientists (Zucker, Darby, & Brewer, 1998), inventors (Jensen & Thursby, 2001), and academic entrepreneurs (Louis, Blumenthal, Gluck, & Stoto, 1989) on successful transfer. A significant literature also exists that explores the effectiveness of different modes of technology transfer, such as patenting, licensing, startup creation, and university–industry partnership (see Lockett, Siegel, Wright, & Ensley, 2005, for reviews). Much of the existing research has highlighted the role of the technology licensing office as a crucial factor in licensing success (Siegel, Waldman, Atwater, & Link, 2000). Other mechanisms of technology transfer include informal channels such as staff exchange and joint publications (Link, Siegel, & Bozeman, 2007). Such informal interaction with university researchers was found to be of more importance for licensing success than formal mechanisms, such as patents and licenses (Mowery & Sampat, 2005). Similarly, Agrawall and Henderson (2002) conclude that open channels, such as publications and conferences, are the main pathways through which industry most benefits from academic research. These studies highlight significant mechanisms for the entrepreneurial and revenue-generating activities of a university.

An implication of these studies is that universities are now more highly motivated to succeed in both academic and commercial spheres. However, this view has not been universally embraced.[3] Many have expressed concerns that heightened entrepreneurial activities have a corroding influence on traditional university roles of research and teaching (Ambos, Makela, Birkinshaw, & D'Este, 2008). Advocates of this view fear that the further engagement of the university in society will dampen its spirit of creative and critical inquiry. Some argue that a concentrated focus on applied science will draw universities away from basic research (Dasgupta & David, 1994;

Washburn, 2005). Others provide more optimistic views, however, including that there are synergetic effects when academic and industry researchers collaborate because they generate new knowledge from applied science (Shane, 2004).

As we discuss more fully in the sections that follow, we believe these studies capture only one aspect of creating an entrepreneurial campus. The basic problem is that, by and large, these studies are narrowly focused on technology transfer as the key engagement mechanism of the university with the commercial world. This focus overlooks other important considerations. In particular, success in academic entrepreneurship involves many processes and strategies by which participants in the campus ecosystem enhance the utility of inventions, which is not limited to commercialization activities. For example, Cyert and Goodman (1997) point out that university–industry alliances constitute an opportunity for learning rather than merely for technology transfer. In our view, this particular opportunity can and should be examined at multiple levels.

3 | CONTEMPORARY ACADEMIC ENTREPRENEURSHIP'S ECONOMIC AND SOCIAL IMPACTS

3.1 | Campus entrepreneurship and urban development

Many academic leaders have come to understand that the modern university is no longer just an institution of higher learning, research, and reflection. Instead, universities are or can be the core of an innovation ecosystem that includes other public and private actors. Universities that fail to create and nurture such ecosystems risk limiting their larger impacts and may thereby starve themselves of the resources necessary for their long-run survival.

Universities can have impacts at—and must be conscious of—the global, national, regional, and local levels. The most direct and immediate impact is at the local level. Universities are often among the largest landowners and employers in their cities, which gives them a central position in the local economy. Moreover, the health and viability of the surrounding locale can serve as a significant deterrent to or driving force for the growth of a university. Yet, too often, a university fails to make a concerted effort to engage with its local community. This is not just about receiving or investing money; it is often more about helping to orchestrate and nurture relationships with local partners.

A notable example of positive local community engagement is the revitalization work done by the University of Pennsylvania (Penn), an "Ivy League" private university located in Philadelphia.[4] As Penn deepened its strength as a top research university, the West Philadelphia neighborhood it occupied remained economically depressed, suffering from high crime, a deteriorating housing stock, and failing schools. The university was aware of the threat that this situation posed to its future viability, but for years, local initiatives intended to deal with this matter were pursued piecemeal.

In 1994, Judith Rodin became the university's president. She understood that Penn had to provide a safe and vibrant physical environment conducive to creativity and innovation in order to attract students, faculty, and industry. She led a coordinated, integrated urban renewal approach covering housing, retail trade, and K-12 education (Rodin, 2004). Penn officials collaborated with community members to devise strategies for financing neighborhood initiatives. The university mobilized intellectual and financial support for the plan, which required both internal and external transformation. Rodin reports, "[W]e had to reorient our administrative culture to work holistically toward simultaneously transforming the university and the neighborhood" (Rodin, 2007, p. 46).

The result has been a virtuous circle. The urban renewal it sparked provided a better environment for stakeholders. New businesses sprung up and created new jobs and a higher tax base, which helped fund better local services. Today, the surrounding area is a recognized innovation hub, with Penn and Drexel University as anchor institutions. From 2004 to 2010, the share of graduates of these institutions who were not Philadelphia natives and who chose to remain in the region rose from 29% to 48% (Campus Philly, 2011).

Recognizing that university entrepreneurship is important leads one to pay attention to broader ecosystems such as the local ecosystem. The activities and interactions that produce long-term value can occur anywhere in the university's ecosystem. Successful ecosystem nurturing depends not only on the institution but also on the capabilities and involvement of individual university faculty and leaders. Faculty members often engage in boundary-spanning activities that allow them to identify opportunities for the university to help shape outcomes. Whereas some university leaders, such as Rodin, will rise to the demands of ecosystem development based on their own inclination and experience, others will need explicit guidance and support. The Penn example is not unique. Yale, for example, has had some success with efforts at turning around socioeconomic decline in New Haven, Connecticut (Stannard, 2018).

3.2 | Entrepreneurship activity among various disciplines

Entrepreneurship has taken root in many corners of the university beyond science departments and engineering, business, and medical schools. Social sciences and humanities departments have also found educational and economic value in becoming more enterprising and engaged in professional training and policy-related analysis and research sponsored by the private sector and federal and state agencies (Clark, 2000, p. 17). Additionally, consulting work that is usually done by faculty outside of their university responsibilities is widespread across college and university disciplines and departments, at least in the United States. A survey of faculty in U.S. colleges and universities found that about half of fine arts faculty were engaged in outside work—about the same as for engineering faculty—as were about 25% of humanities faculty (Lee & Rhoads, 2004, p. 748).

Further in this regard, Niccum, Sarker, Wolf, and Trowbridge (2017) analyzed 13 medical school curricula and over the study period found a notable increase in innovation and entrepreneurship programs and courses. Similarly, Bloom (1988) observed new forms of research entrepreneurship in medical schools, with corporations providing funding for research related to drug discovery and collaboration in the delivery of hospital and ambulatory care.

One approach to facilitating faculty entrepreneurship is to provide faculty flexibility around leaves of absence. As former Stanford University President John Hennessy explained, "We've tried to say to faculty members, you want to go start something, fine, you go off and start. When you're ready to come back, you come back. But sitting here with your mind down there doesn't work."[5]

In yet another example, college and university athletic departments have a long history of helping build brand image and alumni loyalty and have often used entrepreneurial methods to do so. Some colleges and universities offer athletic stadium space for multiple uses, such as trade shows and special events, which can also create strong links to a university's surrounding community and generate revenue from such uses. To illustrate, California State University, Los Angeles' 125-acre multiuse facility yields about $200,000 in annual revenue from sporting event ticket sales (Alstete, 2014, p. 82).[6] Other nonacademic departments can also benefit from enhanced entrepreneurial initiatives. For example, the University of Arizona libraries pursued increase revenues from nonacademic sources, such as cafes and partnerships with athletic departments, to offset persistent funding shortages (Cuiller & Stoffle, 2012).

In this vein, Etzkowitz (2013) argues that auxiliary commercial and cultural activities can be created from any form of knowledge—literary and scientific—and shows how a drama teacher at Southern Oregon School of Education (later renamed Southern Oregon State College) in Ashland, Oregon, initiated a Shakespeare Festival during the 1930s Depression, providing a student training ground that supported development of a nationally renowned theater school that is still vibrant today. This helped develop an arts cluster with ancillary tourist facilities, which made it possible to reconceptualize Ashland as a noted humanities city rather than a traditional natural resource-based (i.e., wood products) city.

This is not to say that the university should favor commercial and entrepreneurial values over research, instruction, and professional activity. The two are complements, not substitutes. The evidence suggests, for example, that faculty who are excellent in outreach and external (entrepreneurial) engagement are also likely to be better researchers (Lowe & Gonzalez-Brambila, 2007; Zucker & Darby, 2007). Faculty entrepreneurs are among the most productive and best cited in their respective fields, even after they form startup companies. In fact, a recent study (see Table 1) showed that, in general, campus entrepreneurs are more productive than peers in terms of annual research papers. This was found to be true for biology, mechanical engineering, materials, electrical and computer engineering, and medicine, but not chemistry (Lowe & Gonzalez-Brambila, 2007, p. 186). An additional finding of great interest is that faculty entrepreneurs experience an increase in annual publications before

TABLE 1 Entrepreneurs' average annual publications: 5 years before and after founded a firm

| | Obs | (a) Before | | (c) After | | (c-a) | Significant |
		Mean	SD	Mean	SD	Difference	Ha: mean (diff) > 0
ECE	46	2.56	3.86	3.66	6.44	1.1	**
Mechanical Engineering	11	0.53	0.61	0.89	0.78	0.36	
Materials and Physics	20	6	6.42	7.94	11.33	1.94	
Chemistry	13	5.22	4.72	6.46	6.38	1.24	*
Medicine	40	5.66	4.9	6.02	4.79	0.36	
Biology	20	3.81	3.09	4.06	3.89	0.25	
Full Sample	150	4.09	4.62	4.95	6.61	0.86	***
Engineering	77	3.16	4.75	4.38	7.88	1.22	**
Biomedical	60	5.04	4.44	5.37	4.57	0.33	
Chemistry	13	5.22	4.72	6.46	6.38	1.24	*

Note. ECE: electrical and computer engineering; SD: standard deviation. Source: Lowe & Gonzalez-Brambila, 2007, p. 184.

*Significant at 10%.

**Significant at 5%.

***Significant at 1%.

and after starting a firm. This is particularly pronounced for engineering faculty (Lowe & Gonzalez-Brambila, 2007, p. 186) and holds not just in absolute terms but also relative to coauthors and peers. Table 1 makes a compelling case for the complementarity of entrepreneurship and research output across multiple scientific fields.

3.3 | Campus entrepreneurship and campus fundraising

Ultimately, academic entrepreneurship aims to expand campus business models beyond teaching and research so that a university can better accomplish its core functions. In some cases, this may involve directly seeking new funds through partnerships with off-campus organizations. In other cases, it may be a matter of raising a university's profile and/or building its brand to attract more funds from governments, businesses, and alumni, including alumni who have founded startup businesses with the assistance, both financial and nonfinancial, of the universities from which they graduated.

It is readily evident that in recent years the funding of higher education has become a prominent concern, especially for public universities in North America and the United Kingdom. Some universities are coping with relatively flat or declining enrollments, which had previously increased about 2% annually from 2007 to 2015 (Ernst & Young, 2017). During the same period, average annual marketing cost per enrolled student in private colleges and universities increased by about $3,300, or more than 50%, reflecting heightened competition for students. Since then, higher education costs have continued to rise. In the United States, competition among universities is even keener than before, yet elements of the public have become skeptical of the value of a university degree. With less public funding available, both public and private universities have been forced to diversify their

revenue sources. Some universities have focused on attracting full-tuition-paying foreign students. Other revenue sources that are aggressively pursued by universities include grants from and/or partnerships with companies, local governments, philanthropic foundations, income from campus-provided services, and fundraising from alumni. As such activities have expanded in the United States, distinctions between for-profit, private nonprofit, and public universities have become blurred (Riedel, 2013).

Further, universities increasingly find themselves competing for the same funding sources as well as for students, faculty, and positions in "league tables." That is, regional, national, and global rankings of higher education institutions provided by numerous sources, such as the *US News*' university rankings and the *Financial Times* business school rankings, have become increasingly important to success in recruiting top students and faculty.

The dramatic decline in state-provided financial support during the 21st century has been especially pronounced in California, which in turn has amplified the need for new sources of revenues for its public universities, including UC Berkeley and the University of California, Los Angeles. These institutions are now very active in fundraising, as evidenced by the growth of their centralized and decentralized—school and department—development offices and the staffing of such offices. This experience has been replicated in most other U.S. states with respect to their public universities (Gardner, 2017; Yang, 2011). It is therefore not surprising that a 2011 survey found that presidents of public universities spent an average of 6.7 days per month on fundraising and that most of these presidents considered fundraising to be among their top three job duties (Jackson, 2013).

One of the more visible manifestations of enhanced fundraising efforts is that wealthy donors have increasingly been receiving credit for gifts by having university facilities and schools and research centers named after them. To illustrate, the number of medical schools

named after donors increased from 15 to 26 during the last two decades (Bailey, 2016). In other examples, in 2015, Harvard renamed its public health school the T.H. Chan School of Public Health in return for this billionaire's record-setting $350 million gift; in 2017, the University of Chicago's economics department was renamed the Kenneth C. Griffin Department of Economics in recognition of a $125 million gift from a hedge-fund magnate; in 2010, University of California, Los Angeles, renamed its medical school the David W. Geffen School of Medicine in recognition of a $200 million gift from the entertainment industry mogul; and in 2008, the University of Chicago Business School was renamed the Booth School of Business in recognition of a $300 million gift of entrepreneur David Booth.

Nonetheless, outside an elite group of some 25 to 50 high-profile public and private colleges and universities, the potential for substantial funding of higher education via private philanthropy is limited (Mitchell, 2015). This means that the vast majority of universities must also become more innovative and entrepreneurial and "bootstrap" their way forward. They simply do not have the donor base necessary to achieve a double-digit percentage of their budget sourced from endowment income and annual giving.

3.4 | Entrepreneurship studies in today's universities

In addition to universities becoming more creative and entrepreneurial about inventing new "business models" for higher education, entrepreneurship studies themselves are also, not surprisingly, receiving greater attention. Whereas 30 years ago, it was hard to find a business school that taught entrepreneurship and new enterprise development, most business schools, as well as some engineering and medical schools, do so now. To illustrate, during the 1990s, funding for entrepreneurial studies in U.S. colleges and universities grew to more than $440 million annually and was used to support more than 2,200 entrepreneurship courses at approximately 1,600 higher education institutions and about 100 entrepreneurship research centers (Kuratko, 2005). It appears that this type of activity and funding has increased even more substantially during the 21st century.

Successful industry partnerships and entrepreneurship programs can also provide opportunities for students to participate in real-world research and gain work experience with industry, local government, and community organizations. In the long run, teaching students how to be entrepreneurs can provide them the tools they need to play an important role in the economy and society. For example, three MIT faculty members estimate that MIT alumni have founded more than 30,000 companies that employ 4.6 million people and generate annual global revenues of $1.9 trillion (Roberts, Murray, & Kim, 2015, p. 6).

Although the teaching of entrepreneurship is important, academic entrepreneurship, when properly formulated, involves a long-term, holistic approach to the challenges facing a university and its local, regional, national, and global ecosystems. A traditional, more limited view of a university's business model recognizes the potential for earnings from licensing intellectual property together with the power of its athletics programs to garner loyalty and financial contributions

from alumni. By contrast, a broader, deeper university entrepreneurship perspective expands this horizon to include the potential for supporting the growth of regional and national economies, bringing together talent from a range of disciplines in order to develop innovative ideas that address practical problems, and building a network of successful alumni and industry partners that will themselves prosper and be better able and willing to financially support the university.

The concept of an "entrepreneurial university" thus needs to extend beyond the commercialization of science to include a wide range of on- and off-campus activities. This type of entrepreneurship encompasses activities that cannot only increase financial resources but also contribute to positive organizational and societal changes. This broader perspective is slowly gaining currency. To illustrate, Mars and Rios-Aguilar (2010, p. 245) define university entrepreneurship as "a process of creating and sustaining economic and/or social value through the development and implantation of creative and innovative strategies and solutions." In short, it is about leveraging research so as to have greater impact.

In the following section, we offer the dynamic capabilities framework as a useful way of thinking about the transformational challenges posed to the development of university entrepreneurship. Leadership issues involved in such development are discussed in a later section.

4 | ENTREPRENEURIAL MANAGEMENT OF THE UNIVERSITY

4.1 | Introduction

Even if a university were to eschew the pursuit of entrepreneurial activities by students and faculty, per se, an entrepreneurial style of management needs to be embraced by campus leadership if the institution is to have a good chance of surviving and prospering. This is especially true for those universities that face vigorous competition for funds and for the best students and faculty. A broad approach, which we have labeled "academic entrepreneurship," recognizes that a university needs to be aligned with the needs and opportunities of its broader ecosystem. Supporting university growth, development, and adaptation requires both entrepreneurial leadership and entrepreneurial management (Teece, 2016). As important as it may be, the efficient "administration" of university operations and issues is not sufficient for a university to survive let alone prosper in today's competitive environment. University leaders must be able to analyze the external environment to identify forces of change, develop and promulgate a strategic vision, and champion an organizational culture that shares the vision and embraces innovation and change. In this regard, the revamping and/or restructuring of lagging departments and research units and the marshaling of resources to address emerging needs and opportunities is a critical role for university leadership.

That an entrepreneurial style of leadership is a key driver of a university's success in an increasingly competitive environment is well recognized if only occasionally achieved (e.g., Clark, 1998). For example, Clark (2001, p. 4) posits that "the entrepreneurial response" of

universities has become a growing necessity for universities that want to be a viable, competitive part of the rapidly emerging global order of higher education. Similarly, Sporn (1999) emphasizes the importance of a university's adaptability to a shifting environment for its survival and argues that successful adaptation can be implemented through "shared governance," focusing on the participation of all internal stakeholders as well as stakeholders in the broader ecosystem.

Entrepreneurial management constitutes the core of what we refer to as dynamic capabilities. Strong dynamic capabilities among a university's leadership team will encourage and support the type of academic entrepreneurship that benefits the campus and its ecosystem.

4.2 | Leadership and management as dynamic capabilities

In the higher educational sector, it is common, indeed universal, to identify students, faculty, and administrators as the three dominant constituents. The word "administration" implies a relatively mid- to low-level function that oversees and implements various processes ranging from student enrollment to faculty appointments to grant applications to facilities maintenance and more. What it does *not* imply is the higher order need for effective leadership and management of these institutions. This dual function is critical for the following reasons:

- A combination of leadership and management helps create and deliver value to a university in numerous ways, including seeding and supporting entrepreneurial initiatives such as incubator laboratories, field studies, and new ventures.[7]

- The emotional intelligence of university leaders and managers is key to capturing value from academic entrepreneurship. Emotional intelligence research indicates that a combination of authoritative, affiliative, democratic, and coaching leadership styles enhances the organizational climate and, in turn, organizational performance. By contrast, coercive and pacesetting leadership styles have opposite effects.[8]

- Leadership skills are required to develop and sustain dynamic capabilities (Teece, 2007, p. 1335) that, in conjunction with other capabilities—technological, organizational, knowledge, and skills—hold the potential for substantially improving the performance of universities. Leadership involves coping with change, setting direction, aligning people with the organization by empowering them, and motivating people, including through networks of informal relationships. Management involves coping with complexity, planning and budgeting, organizing and staffing the work to be done, exercising control, and problem solving.[9]

Most successful policies in higher education institutions have come from the top; in other words, leadership matters (Kerr, 1982, p. 30). Leadership also matters with respect to the organization's ability to effectuate discovery, cocreation, and change (Teece, 2014, p. 339). An especially important role for university leaders is orchestrating

assets, which is a core component of dynamic capabilities. Asset orchestration involves the selection, configuration, alignment, and modification of tangible and intangible assets (Helfat et al., 2007), which, if done well, enables a university to achieve success. In this regard, universities must figure out how to deploy their assets within collaborative partnerships that yield value to their partners and stimulate new economic activity, while at the same time protecting and enhancing their historical research and teaching mandates.

University expenditures can be viewed in terms of talent and time as well as money. Talent is frequently applied to academic programs without regard for the "cost" of that talent because such talent is seen as addressing a particular short-term need. Therefore, the challenge to university leaders is to deploy talent, time, and financial resources in a balanced fashion in order to achieve their institutions' objectives. This task is not amenable to conventional productivity tests nor are conventional cost-saving measures applicable to it either.[10] Rather, successful universities feature the orchestration of three elements—talent, time, and finances—in such a way that their programs result in higher value added and lower overall expenditures (Peck, 1984, p. 277).

Below, we discuss in detail the three clusters of dynamic capabilities and offer several propositions concerning the roles of entrepreneurial leadership in the development of university dynamic capabilities.

4.3 | Elements of the dynamic capabilities framework

As early as the 1980s, Keller (1983) argued that university leaders should become more strategic, both externally and internally. Such strategic thinking can be guided by the dynamic capabilities framework, which is an approach to building long-term competitive advantage that has been widely discussed in the strategic management literature and applied to companies as well as public and nonprofit organizations.

Dynamic capabilities are defined as the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece, Pisano, & Shuen, 1997, p. 516). The key point here is that managers who face business environments challenged by volatility, uncertainty, complexity, and ambiguity (VUCA) cannot simply be efficient administrators if their organizations are to remain viable. Organizational effectiveness is just as if not more important than operational efficiency. Effectiveness requires organizational leaders to identify opportunities and manage threats. These are entrepreneurial traits that a senior leadership team must possess, especially in today's VUCA environment.

Dynamic capabilities are quite different from ordinary capabilities, which enable the performance of administrative, operational, and governance-related functions. Dynamic capabilities involve higher level processes that can enable an enterprise or an institution to direct its resources and activities toward high-payoff endeavors. This requires managing or "orchestrating" an enterprise or institution's

resources to address and shape rapidly changing external environments (Teece, 2014, p. 328). When funding from state and federal governments was stable and in line with costs, perhaps many universities could survive with just ordinary capabilities. Today, with public funding declining and becoming less predictable, it is of vital importance that campus leadership develops and employs dynamic capabilities.

Dynamic capabilities are embodied in individuals, processes, and organizational governance structures. The primary managerial processes that support a university's dynamic capabilities are its ability to sense opportunities and future trends; prioritize the investment of resources; and, from time to time, offer new degree programs and research centers and institutes to seize the most promising opportunities. This inevitably also involves transforming the university to keep it

resilient and aligned with its ecosystem (Teece, 2007). The old must be shut down or phased out to make room for the new.

Dynamic capabilities can be categorized into three clusters: sensing, seizing, and transforming. Each cluster must become well-honed and must engage university presidents, their senior executive teams, and ultimately the faculty if universities are to succeed in the increasingly competitive environments in which they operate. A university's governance structure must also support the bold moves that campus leaders sometimes need to make as they seek to achieve evolutionary fitness. Figure 1 and Table 2 depict this high-level view of dynamic capabilities in a university setting.

The dynamic capabilities framework in effect takes a system-level approach to organizational and institutional management (Teece, 2018b). This approach requires university leaders to recognize the
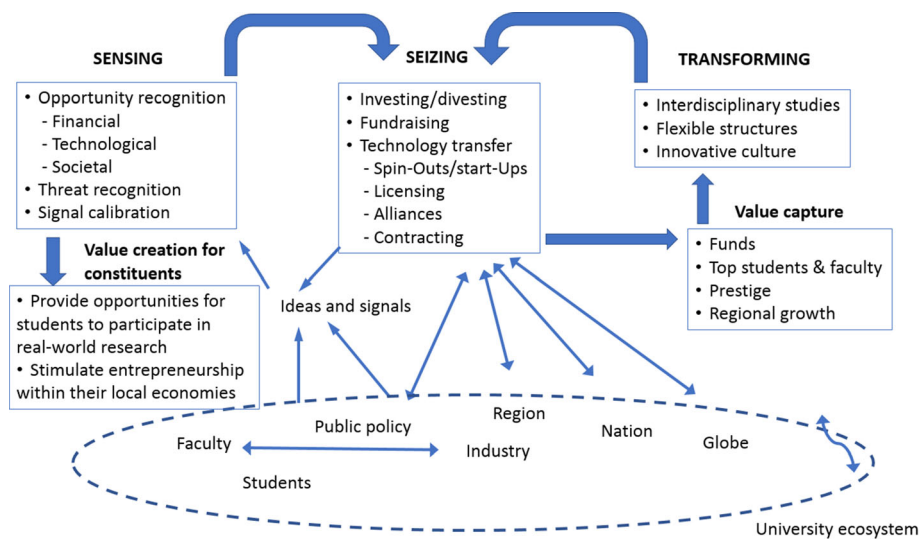

FIGURE 1 A system-level view of dynamic capabilities and campus entrepreneurship [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 2 Entrepreneurial leadership, dynamic capabilities, and campus entrepreneurship

Entrepreneurial leadership and dynamic capabilities	Campus entrepreneurship	Citations
Sensing (Proposition 1) - Encourages both academic and nonacademic departments to identify commercial opportunities and impediments - Identifies nontraditional structures allowing the freedom to explore new ideas - Validates and communicates observations about emerging trends	Value creation for constituents (Proposition 1a) - Enables faculty to continue research programs that otherwise might be closed - Stimulates entrepreneurship within local economies - Provides opportunities for students to participate in real-world research and gain work experience with industry - Offers opportunities to cocreate shared value with constituents	Etzkowitz (2013); Mody and Nelson (2013); Cuiller and Stoffle (2012); Roberts et al. (2015)
Seizing (Proposition 2) - Involves resource commitments behind value (financial and nonfinancial) generation and value capture for the campus and relevant constituencies - Manages potential conflicts of interest - Offers interdisciplinary entrepreneurship programs	Value capture for the university (Proposition 2a) - Attracts more talent - Improves size and visibility of research operations - Increases giving from alumni entrepreneurs - Builds a reputational advantage (responding to societal needs makes universities appear more accountable) - Increases cross-campus coherence	Gulbrandsen and Smeby (2005); Auletta (2012); Adeniji (2015)

institution's internal and external interdependencies and determine which are most critical. For example, although academic entrepreneurship can be highly consistent with a university's research mission, certain activities may be inconsistent with a university's teaching function (Lee & Rhoads, 2004). To illustrate, one study found that faculty who are highly engaged with and receive financial support from industry publish as many as if not more scientific articles than their less-engaged or nonengaged peers (e.g., Gulbrandsen & Smeby, 2005). Another study found that external involvement with industry actually increased faculty research productivity (Lowe & Gonzalez-Brambila, 2007). However, other studies find that academic entrepreneurship may detract from the amount and quality of teaching done by the faculty engaged in such entrepreneurship (e.g., Bianchini, Lissoni, Pezzoni, & Zirulia, 2016; Kim, 2008; Lee & Rhoads, 2004). This research-teaching interdependency poses a considerable challenge to university leaders, who must decide whether and how to manage it, and the extent to which it can be managed.[11]

Some studies have begun to apply the dynamic capabilities framework to the university setting (e.g., Teece, 2018a, 16:1). For example, Leih and Teece (2016, p. 182) observe that university leaders who marry strategic thinking with capability development enhance the likelihood of a university's long-term survival. Relatedly, these authors contend that university presidents need to proactively manage not only their institutions but also their innovation ecosystems to increase the likelihood that their institutions will prosper in an increasingly competitive, uncertain environment.

As such, the dynamic capabilities framework can serve as a useful framework to help guide campus entrepreneurship. For public universities, effectively seizing new entrepreneurial opportunities can generate nonstate funds that can be used to support disciplines, departments, programs, and activities that have limited potential to be self-funding. When done transparently and in line with a well-honed strategy, financial cross subsidization can help reduce the tensions that result from each university department pursuing (or not pursuing) its own entrepreneurial activities. A relevant historical example in this regard is Stanford University, which during the 1960s strategically allocated resources to new and emerging fields, thereby contributing to its subsequent academic ascent (Box 1). In the next section, sensing, seizing, and transforming aspects of dynamic capabilities are discussed in greater detail.

Box 1 Strategic Asset Orchestration at Stanford University

Albert Bowker, who was chancellor at UC Berkeley in the 1970s, recalls his earlier experience as an administrator at Stanford under Fred Terman:

The number two man at Stanford is the provost, and I was one of his deputies ... We reviewed all budgets and all faculty appointments as a provost staff ... But the main thing we did when Fred [Terman] was provost was to look around the university and decide what opportunities there were to continue to build Stanford into a great university and where to put our resources. There were certain things, I suppose, that one would have to do. The Chemistry Department was not in very good condition, and Fred, pretty much by himself, nosed around a lot and finally decided that a couple of organic chemists named Johnson of Wisconsin and Carl Djerassi, at that time at Wayne State, could build a department. We needed to get a building for them, and he worked on a corporation to donate a building and put that all together.... That was a brilliant move in some ways, and the department has had first-rate people ever since....

Once we were talking: "We have a good History Department, but it isn't absolutely at the top of the heap." Maybe Dick Lyman was chairman then. "It wouldn't be very expensive to improve it." So we decided to do that, and we put three rather famous historians in-- Gordon Wright, Gordon Craig, and David Potter. These three people immediately put Stanford into a first-rate category. We did the same thing in English.

One day I went in and said, "You know, we really have this big activity in radio astronomy, largely in engineering. I don't know how things are going to happen; maybe we should think of astronomy." Fred said, "I don't really think so. For one thing, we'd need an awful lot of optical equipment, and we don't have it, and it's pretty expensive. Cal Tech and Berkeley and other places are well established. I really don't think we could compete." I kept arguing--electronics might be the way to make astronomical observations in the future. He said, "No, I don't think so. I just think it would be too expensive. We'd never be very good, and we'd waste a lot of money." He was right. (Bowker, 1991, pp. 139–140)

4.3.1 | Sensing

In the dynamic capabilities framework, sensing refers to activities undertaken to scan an organization's external environment, understand the signals received, and develop hypotheses about potential avenues for future growth. Sensing is critical to sensemaking. Identifying opportunities detected through scanning is required in order to create value for stakeholders.

As an example in a university setting, scanning may identify the potential for adoption and/or expansion of online courses and programs that provide options for existing students and that may expand the student base. Scanning also enables threats to be recognized. Examples of such threats in a university setting include new, disruptive technologies for delivering higher education and a shift away from public or political support for higher education funding. Sensing is also an internal activity; for example, a dysfunctional unit or a wayward dean engaging in improper behavior can be as large a threat to a university's future as any budget cut.

Former Stanford University President John Hennessy attests to the importance of sensing. He summarizes it as follows:

> I view the role of the President as scouting for opportunities, possibly by bringing a group of faculty together that kind of know each other, but need a little inspiration and maybe a little funding and a little incentive to come together and do something. I think that's especially important when we are doing

something new. Faculty go their own way, they do their own thing. The challenge is to do something that creates a synergy among them and enables us to do something larger. It could be because it enables us to do research we could not do before. Sometimes it can attract philanthropy that could not be attracted with ten individual efforts. So I am constantly looking at that, I think of myself as the scout trying to match the talents we have in the faculty. Sometimes you look at it and you say, Okay, here's an area that's emerging. For example, neuroscience. The area's getting bigger, it's growing by leaps and bounds. It's a critical area. It's a big frontier in human medicine. You look and you say, Can I get a group of faculty to get together between the medical school, engineering and biology. Are we missing people who do the following? And then we'll look for ways in which we can help finance that or establish it.[12]

University leaders with strong sensing capability solicit new ideas from all sources, on and off the campus, in a continuous learning process conducted in formal and informal ways. To illustrate, President Hennessy stated the following about enhancing the growth of a premier university:

I think there's always a question of what should be the next major moves the institution wants to make in terms of big picture things. I have put a lot of emphasis into building up disciplinary or multi-disciplinary research centers. The question is, what do we want to do next? What do we want to think about as a new opportunity? You know we own two hospitals; we have a medical complex on campus. It's growing by leaps and bounds. These things are going to raise tricky management issues. And then you know there are the logistics of living in the San Francisco Bay Area: housing prices, staff issues, and transportation. I think we are at a point where—while we have not used up all our land by any stretch of the imagination, we have to use it carefully going forward. So thinking about where do you want growth to occur? What kinds of things would be best for the institution? What will have the best societal impact? That's something my successor is going to have to contend with.[13]

In this regard, university leaders faced with VUCA environments must obtain and assess information to make decisions about their institutions' futures (Day & Schoemaker, 2016; Schoemaker, Heaton, & Teece, 2018). Such information is not limited to formal databases. Successful university leaders "walk the campus" and attend university events not merely out of interest but as a means of gathering relevant information.[14] University leaders also use their relationships with university constituents—faculty, students, staff, trustees, and others—to learn about these constituents' goals, ideals, ambitions,

impressions, and insights that reflect the spirit and affect the functioning of these institutions. Hence, university leaders are also listeners, the result of which is not merely information, but intelligence (Peck, 1984, p. 271). University leaders can then use this intelligence to clarify the missions of their respective universities, determine the type and scope of new academic entrepreneurial initiatives, and manage and mitigate interdepartmental and other types of conflict that may emerge due to such initiatives.

Once opportunities and threats are identified through scanning, university leaders must make sense of them, prioritize the attention they will give to them, and determine the resources they will provide to them. This is a challenging task, not in the least because of the many demands on university leaders' time and effort. Nonetheless, without adequate sensing and sense making capabilities, university leaders will be late—behind the curve—in identifying promising future directions for their institutions and in creating value for their constituents.

This reasoning and these examples lead to the following propositions:

> **Proposition 1.** *An entrepreneurial university leadership style facilitates higher levels of* sensing *capability at the university level.*

> **Proposition 1a.** *Higher levels of* sensing *capability will be correlated with higher levels of campus entrepreneurship (value creation).*

4.3.2 | Seizing

A university's seizing capabilities are intended to convert opportunities into actions. Simply diagnosing opportunities and threats facing a university without converting the diagnosis into action is a vacuous exercise. As noted earlier, academic entrepreneurship involves harnessing resources from a range of internal and external stakeholders in order to serve specific university interests as well as broader social and economic purposes. A university must generate value for multiple constituents and capture some part of that value to serve its broader purposes. The value may not be monetary or immediate. For example, breakthrough research in new fields can enhance a university's stature and help it to attract both funding and talent.

Seizing capabilities vary by university and to some extent are "baked" into a university's organizational design by the governance structure in place. For example, UC Berkeley has a relatively decentralized, diffused organizational structure that makes it difficult to achieve coordinated decisions and actions. This is attested to by Michael Heyman, who served as this university's chancellor during the 1980s:

If you actually look at the operating authority, the authority that comes by virtue of the position for a department chairman, it's almost nil … So if you want something done by departments, … it was new to them.

> *You asked the chairman, because the strike is going on, to report whether people are meeting their classes. He did not have any apparatus for doing that. None of those chairmen thought about their role that way. They were first among the equals. They had the job for a temporary period and they were delighted to move on. So the whole administrative structure was characterized by complexity and slow response time.*[15]

A contrasting example, provided by the former dean of Stanford University's School of Engineering, highlights the importance of decisive action:

> *Fred Terman had the view that the intelligent use of government money in those days, when things were pretty easy, meant it could be used to support faculty and could be used to support a department. That's really how Terman built the Engineering School. He jumped into federal money much harder and faster than Berkeley, aside from the laboratories, or Harvard or most places, and had lots and lots of federal money all over the place. He brought people in, and the good ones were appointed to the faculty. And we had graduate students like David Packard and William Hewlett, and Russell and Sig Varian. Terman decided to build the tube industry here and did. Berkeley was much more conservative in those years. (Bowker, 1991, p. 126)*

Designing a value-capture mechanism for a given entrepreneurial initiative requires the capability to develop various types of "business models" (Teece, 2010, p. 191). In a university setting, where most activities do not come with a profit-and-loss statement, business-model thinking can nevertheless help university leadership define the value proposition for relevant stakeholders (e.g., students, faculty, and alumni), think systematically about how to deliver value, and gain financial and other benefits for the university. For instance, as universities become more involved with incubators and business venture startup opportunities, they need to make early decisions about how much to seek the value (if any) generated by these initiatives. John Hennessy describes the approach that he and his Stanford colleagues took in this regard:

> *Our goal is not to extract blood from a young startup, but to help them be successful. We believe that in the long term, the benefits will come back to us … Our view is the philanthropic benefits long-term dominate other things long-term … That means building a relationship.*[16]

One way for universities to capture value is by rethinking the uses of underutilized land, property, and facilities. These assets are often quite valuable. During the 1950s, for example, Stanford University leased land at the edge of its campus to a high-end shopping mall developer, which later became a reliable source of revenue (Jordan, Shorter, & Weinshall, 2013). During the 1990s, Johns Hopkins University's leaders turned four historic townhouses into the Peabody Inn, yielding new

funding for the Peabody Institute, the university's music school (Bridges & Brant, 1994, p. 40). In 2004, Emmanuel College, a private Catholic liberal arts institution in Boston, leased a site on campus to Merck, a large pharmaceutical company, which used it as a research facility that subsequently generated $50 million for the college and new collaborative possibilities for faculty and students (Di Meglio, 2008).

Universities with strong seizing capabilities also align their teaching of entrepreneurship with their respective institutional cultures and missions, thereby enhancing the acceptance of this subject. For example, the University of North Carolina at Chapel Hill decided to include aspects of social entrepreneurship in its degree programs because otherwise "the whole [entrepreneurship] initiative would not be perceived as congruent with the values of the university" (Thornton & Jaeger, 2007, p. 1010).

Similarly, since 2003, UC Berkeley's Socially Responsible Licensing Program (SRLP) has been promoting the availability of technologies, some of which it initiated, in developing countries in order to optimize the public benefit of such technologies (Mimura, 2006). In this endeavor, traditional performance metrics, such as number of licenses granted and licensing revenue, are combined with social impact metrics, such as number of lives saved and funding of neglected disease research. The Socially Responsible Licensing Program has been enabled by the development of specialized business models that incorporate innovative contract provisions, including the nonassertion of intellectual property rights, royalty-free licensing, forbearance of patenting in developing economies, mandatory sublicensing to achieve a particular price point, and tiered pricing within a given country (Mimura, 2010). This program has been successful across sectors including health care, agriculture, and water treatment.

Seizing capability also involves establishing fruitful connections among individuals, groups, and organizations; designing business models; marshaling financial and nonfinancial resources; and applying entrepreneurial skills. Perhaps less obvious but no less important is the creation of suitable physical spaces on or near a university campus to allow the business or technology incubation process to begin and thrive. Seizing also involves selecting suitable, knowledgeable university partners, indicating in turn that successful university leadership is a team effort and that managing partnership teams is of paramount importance. John Hennessy attests to this, as follows:

> *The key lesson I have learned is that finding the leaders among faculty is so vitally crucial. I cannot do everything, the deans cannot do everything. you have got to have a member of the peer group step up and say: "I am going to put some of my personal energy and my personal research time, and my personal reputation into making this thing successful for the greater good that it will do." And that's a challenge, to find the people to do that.*[17]

When university leaders undertake new academic entrepreneurial initiatives, senior faculty and/or other constituents can provide continuity and maintain the cohesiveness of a university. By doing so, they

can potentially help all schools and departments of a university to succeed, including by increasing the sources of income available to those schools and departments. In sum, effective university leaders can use the collegial environment of their institutions to encourage collaboration among schools and departments, caring for the end user and supporting academic entrepreneurship.

Universities can play a larger role in the community beyond research and teaching missions. But in order to achieve these outcomes, a university must be astutely led and managed; it can no longer be simply "administered." This means, in turn, that university leaders must have an ear to the ground and an understanding of how to respond to opportunities and threats in order to capture value and thereby serve a university's broader purposes.

This reasoning and these examples lead to the next two propositions:

> **Proposition 2.** *An entrepreneurial leadership style facilitates higher levels of* seizing *capability at the university level.*

> **Proposition 2a.** *Higher levels of* seizing *capability will be correlated with higher levels of campus entrepreneurship and associated value capture.*

4.3.3 | Transforming

Because long-established institutions have a tendency to ossify, transformation is often necessary to execute a particular plan or improve other capabilities. The transformation can be straightforward, such as renovating an old laboratory, or it can be fundamental, such as altering a faculty salary structure and recognition awards in order to change the balance between research and teaching. Undertaking new transformation initiatives also often requires scaling back or ending prior failed initiatives. Transforming physical infrastructure is often easier than changing organizational habits.

Indeed, one of the potentially most powerful transformational levers is an organization's culture, which can be supportive of or opposed to academic entrepreneurship. Organizational culture comprises norms, values, beliefs, and expectations of organizational members (mainly employees but also others). If these are widely and deeply shared, then an organization—a business, university, or other type of organization—has (or can claim to have) a strong organizational culture. If they are not so shared, then an organization has a weak organizational culture.

Viewed as one among several components of internal organizational alignment, organizational *culture* can be transformed, but it takes considerable time and effort to do so. This is because an organizational culture, especially a strong one, typically resists change (Koch & French, 1948). Therefore, when a university undertakes new academic entrepreneurial initiatives, it is important to recognize and celebrate the institution's past and current achievements while also laying the groundwork for potential new achievements. This is especially the case when a university seeks new corporate funding to support entrepreneurial ventures, which may run counter to prevailing norms, values, beliefs, and expectations among faculty, students, and other constituents.

Organizational *structure* is another component of internal organizational alignment that can be used to transform the capabilities of a university. As with most businesses, as well as nonprofit organizations and government agencies, universities for the most part have a largely vertical, hierarchical organizational structure; however, the informal structure of most American research universities is remarkably flat. Within these universities, there is typically a departmental structure in which decisions about research, teaching, service, and other activities are made on a siloed within-department basis. By contrast, academic entrepreneurship often crosses departmental boundaries and requires interdepartmental and interdisciplinary collaboration—that is, horizontal collaboration. This often requires overcoming strong embedded incentives that favor narrow specialization and the entrenched vertical departmental structure of a university. It also involves managing departmental faculty, especially senior faculty, who have risen to prominence within their respective departments and who, in some cases, may be strong personalities.

Leaders are crucial to the development of such transformational capabilities. Successful university leaders must provide the context for change. They must also be the initiators of change, even though they do not do so alone. They rely on and work with their management specialists and professional staff, as well as faculty, students, and other constituents, and thereby seek to foster mutual respect among all of these key interest groups. By doing so, university leaders attempt to use their organizational cultures to support academic entrepreneurship. This characterization is supported by former University of California System President Clark Kerr, who described a university leader as follows:

> [...] leader, educator, creator, initiator, wielder of power, pump; he is also officeholder, caretaker, inheritor, consensus-seeker, persuader, bottleneck. But he is mostly a mediator. (Kerr, 2001, p. 27)

Former Yale President Levin puts it more specifically, as follows[18]:

> It's getting the message out and patiently talking about it with skeptical audiences, answering questions, being open and responsive to suggestions and change, but also not yielding on the core vision. One of the great things about faculty is they are basically rational, even though they are very independent. And so, persuasion is possible. If you have a compelling argument - eventually you'll win. Transformation is having a vision and bringing people along.

This reasoning and this example lead to the following proposition:

> **Proposition 3.** *An entrepreneurial university leadership style facilitates higher levels of* transformational *capability at the university level.*

5 | CONCLUSION

This paper attempts to provide a deeper understanding of the multiple dimensions of campus entrepreneurship. As such, it is intended as a corrective to the extant literature that either underemphasizes or oversimplifies the nature and scope of universities' entrepreneurial activities and their potential impact on universities' internal dynamics and functioning. The paper addresses this gap by linking academic entrepreneurship to longer term value creation and value capture that can benefit universities' internal stakeholders and the public more broadly.

As noted above, campus entrepreneurship can also lead to unequal access to resources among schools and departments within a university and thereby generate internal conflict. However, if astutely led and managed, campus entrepreneurship can stimulate a university to better fulfill its multifaceted mission. For this purpose, the dynamic capabilities framework elaborated herein links academic entrepreneurship to value creation and capture. The framework also posits that academic entrepreneurship, per se, requires university leadership that is itself entrepreneurial. This should not be surprising, because the lack of such leadership helps to explain why academic entrepreneurship is absent from many universities.

This paper also contributes to the university technology transfer and entrepreneurship literature. In this literature, discourse on technology transfer and entrepreneurship has been largely limited to the commercialization of inventions originated from campus laboratories (e.g., Link et al., 2007; Siegel et al., 2000). From the broader perspective offered in this paper, campus entrepreneurship includes university–industry partnerships, the teaching of entrepreneurship in degree program courses, and enhanced collaboration among otherwise siloed schools and departments of a university. Specifically, our paper strongly emphasizes the role of university leadership in academic entrepreneurship and posits that university leaders can significantly influence the extent to which universities create and capture value from such entrepreneurship.

This paper also highlights the relevance of dynamic capabilities as a framework for thinking about the longer term strategic leadership and management of a university apart from and beyond entrepreneurial ventures. Strong dynamic capabilities govern a university's survival and growth—in other words, its evolutionary fitness. Without adequate sensing capabilities, universities will be behind the curve in identifying opportunities of creating value for both their institutions and their constituents. For public universities, effectively seizing new entrepreneurial opportunities can generate nonstate funds that can be used to support disciplines, departments, programs, and activities that have limited potential to be self-funding. To take up their expanded roles, universities need to transform. Successful university leaders must provide the context for change.

Campus entrepreneurship is not limited to new ventures in science and technology; instead, it permeates a university and thereby benefits numerous stakeholders, including long-standing schools and departments and newer ones as well (Clark, 2001, p. 21). In this regard, Christensen and Horn (2013) argue that new competency-based universities (e.g., the Franklin W. Olin College of Engineering and the entrepreneurship-focused Babson College) have motivated traditional universities to improve.

Campus entrepreneurship raises complex issues because a university's relationship with industry and with new ventures often leads to questions about propriety, independence, and fairness. The central question here is not whether the net impact of such entrepreneurship, taking into account its benefits and costs, makes university–industry alliances worthwhile, but rather how academic entrepreneurship can be most effectively led and managed.

The study also has some limitations. First, the primary data used herein are based on interviews that limit the generalizability of our findings and conclusions. However, the main purpose of the study was not to provide generalizability of empirical results, but instead to "expand theories" (Yin, 1984) with respect to campus entrepreneurship. Second, this study is largely limited to research universities, which constitute a relatively small proportion of universities in the United States and abroad.

These limitations also lead to suggestions for future research. For example, in light of the propositions presented herein, empirical research is needed on the actual and potential impacts of academic entrepreneurship on different types of universities, such as research-only universities, liberal arts-focused and science-focused universities. Further, a more fine-grained understanding is required of the nature of the environments in which universities operate (Leih, Siegel, & Teece, 2018).[19] In sum, greater understanding of how dynamic capabilities moderate the relationship between academic entrepreneurship and value creation or capture is sorely needed.

ENDNOTES

[1] Implications of our research tend to be limited to the case of research universities. For example, discussions of university technology transfer offices are relevant only to research universities, because most teaching universities and community colleges do not have such offices.

[2] An exception is a recent paper by Leih and Teece (2016) that focuses on broad university management issues.

[3] "The university can be a driving force if it's a great center for science – not if it's a great center for technology transfer. Technology transfer is ... a secondary objective at best, probably even a third-level objective. Anybody that moves it to a higherlevel objective than that is foolhardy. Because they will corrupt the university for sure." Michael Crow, president of Arizona State University (Washburn, 2005, pp. 187–188).

[4] The case of Penn is drawn from Leih et al. (2018).

[5] Unpublished interview of John Hennessy, August 25, 2015.

[6] On the negative side of this particular ledger, the commercialization of college athletics has produced a string of scandals regarding lax enforcement of academic standards and related violations of college and university policies and, in some cases, federal and state laws (Smith & Willingham, 2015).

[7] On the distinction between leadership and management, see Kotter (1990) and Zaleznik (1977).

[8] Goleman (2000). In this article and in most of the related literature, *emotional intelligence* is abbreviated as EQ, where Q represents *quotient*. This reflects an obvious attempt to put emotional intelligence on the same analytical level as intelligence quotient (IQ).

[9]In this regard, the leadership framework developed by Vroom and Jago (2007) is particularly apt. This is because their framework focuses on contextual decision-making variables, such as the complexity of a decision, information requirements for the decision, and time to decision, rather than on the personality characteristics that are featured in most other leadership frameworks.

[10]The value added results from the synergy and complementarities among the management of talent, time, and finances or, in other words, the treatment of these three elements as a unified set. This is closely similar to what has occurred in companies that treat these elements as a unified set. Similarly, by doing so, the costs of each element are lower in comparison with treating each element separately as isolated functions or silos, again replicating the experience of companies. Conventional productivity tests are typically applied to each element separately, which is at odds with this integrated, unified set concept and practice.

[11]Solutions range from partial leaves of absence to part-time employment contracts with universities. Each has its own challenges.

[12]Unpublished interview of John Hennessy, August 25, 2015.

[13]Id.

[14]Walking the campus is essentially an application of "management by walking around," pioneered by Bill Hewlett and David Packard, who served for decades as the co-CEOs of Hewlett-Packard. See Beer and Rogers (1995).

[15]Nathan (1986).

[16]Unpublished interview of John Hennessy, August 25, 2015.

[17]Unpublished interview of John Hennessy, August 25, 2015.

[18]Unpublished interview of Richard Levin, November 9, 2015.

[19]In this respect, Leih et al. (2018) propose that the roles of universities differ depending on the developmental stages of their innovation ecosystems.

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