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OPERATIONALIZING STEWARDS OF PLACE

IMPLEMENTING REGIONAL ENGAGEMENT AND ECONOMIC DEVELOPMENT STRATEGIES

Richard Dunfee and Ashish K. Vaidya, Editors

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Foreword

George L. Mehaffy

Regional comprehensive universities, in particular those that belong to the American Association of State Colleges and Universities (AASCU), have often struggled to define themselves. Caught in the middle between the often better-known research universities and the more ubiquitous community colleges, regional comprehensive universities usually have a primary focus on teaching but are responsive to regional needs much like their community college colleagues, and they conduct research like their research university colleagues. Yet the institutions' primary focus on teaching, with bits of regional concern and research efforts thrown in, have not yielded a simple or coherent mission that is easily understood by either the institutions themselves or by external observers.

That failure to develop a coherent identity has led, in some cases, to pernicious results. In some cases, regional comprehensive institutions have abandoned the commitment to teaching, striving for a perceived higher status by emphasizing research. Sometimes institutions try to be all things to all people. Sometimes the lack of clarity of mission has led to continuing adjustments of emphasis—with institutions momentarily elevating one priority, then elevating another priority a short time later. All of these failures to develop a coherent, comprehensible, and consistent vision of role and mission have resulted, far too often, in confusion, mixed messages, inappropriate emphases, and wasted time and resources.

The lack of clarity of mission and role animated the search for a new way of thinking about the unique roles and purposes of regional comprehensive universities. In 2002, a task force at AASCU proposed a new perspective, suggesting that regional comprehensive universities are "stewards of place." In a landmark publication, *Stepping Forward as Stewards of Place,* the task force argued that AASCU institutions have a unique role to play in the intersection of teaching, scholarship, and service to their communities and regions. The task force argued that the place-focused lens uniquely shaped the work of regional comprehensive universities, where teaching, scholarship, and service could combine in unique ways to serve their communities, while fulfilling the traditional commitment to provide quality education.

Yet the 2002 publication, while seminal in its contribution of the concept of stewardship, only began the difficult task of formulating a new vision and translating that vision into practice. The task force's work focused on how to align an institution to undertake a commitment to stewardship. Despite a grand vision of stewardship, the 2002 publication did not provide guidance on how the work of stewardship might proceed. So in 2014, a new AASCU publication, *Becoming a Steward of Place,* explored in detail ways that institutions could implement stewardship across four dimensions: civic engagement, work with P-12 schools, community and economic development, and internationalization. Each of the chapters in that publication, and a companion volume examining applications of the Carnegie "community engagement" classification, provided examples and rich detail about how to go about the work of community and regional stewardship.

Even the 2014 publications, however, because of limitations of space, at best provided only sketches of how the work might be framed and undertaken. Campuses still wanted more specifics, more details, and more examples. Out of those needs emerged this guide, *Operationalizing Stewards of Place.* It continues the vital work of conceptualizing and explicating how an institution undertakes the work of community and regional stewardship. This publication provides the most granularity, the greatest detail, the most specific and concrete information about how regional comprehensive universities have gone about the work of community and economic development, one of the four dimensions of stewardship described in the 2014 *Becoming a Steward of Place.* And like the 2014 volume, this new publication also offers advice from an AASCU president, Michael Driscoll, about some of the opportunities and pitfalls of engaging more actively in your region.

Operationalizing Stewards of Place continues our efforts to help our member campuses define, refine, and shape the critical roles that they play in the landscape of American higher education. The editors, Richard Dunfee and Ashish Vaidya, envision this to be a "living document." Future iterations, extensions, and additions will be shaped and influenced by the work that we continue to do and the challenges we face.

Stewardship of place is a vital role through which AASCU institutions make enormous contributions to the education of citizens for careers and community service by strengthening the regions where we live. Through AASCU universities' stewardship, we are building a stronger democracy, a more powerful economy, and a more just society.

About the Author

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Regional Engagement: A President's Perspective

Michael A. Driscoll

There is no doubt that AASCU institutions are experiencing accelerating pressures to change how they develop strategies and execute their missions relative to the regions they serve. The chapters in this book appropriately focus on workforce development, technology transfer, and development of new businesses, providing examples of successful initiatives, ideas for overcoming potential challenges, possible measures of success, and other resources for leaders looking to enhance their institutions' efforts in these areas. The authors also correctly point out that to stay true to their calling to be "stewards of place," AASCU institutions must also focus on community and social development and understand that success requires careful attention to institutional cultures—developing students, faculty, and staff and creating structures and policies appropriate to their local environments.

Perspectives on Regional Engagement

While reading the chapters that follow, I identified a few broad themes that are common to successful initiatives. I hope you'll find my thoughts helpful as you develop your own approach to leadership in these crucial areas. I've summarized each theme with a quote from popular culture, each of which occurred to me while I was reading. See if you can identify the source before you look at the footnote.

Do You Know Where You're Going To?[1] The range of goals, projects, and activities an institution might consider is remarkably broad, and it is very important to clearly focus on the desired results before starting to work. Perhaps it is appropriate to work on partnerships that will produce more engaged learning experiences for your undergraduate students, with the resulting benefits of enhanced learning and alumni who have already had significant work experience when they graduate. Perhaps partnering with regional economic development agencies to retain current industries and jobs and to attract new ones makes sense for your region. If you have a Small Business Development Center, you can focus on providing more education and support to owners of small businesses in your town or county. It may be that transforming your general education program to include innovation and entrepreneurship is the best idea. Or perhaps your faculty

researchers are developing valuable intellectual property that is not being brought to market to benefit the university and the economy.

As you work to define your goal, don't forget to think about the size and scope of your efforts. It may be reasonable to start small, aiding and rewarding a few faculty members as they follow their interests, or perhaps an academic department or college is ready to step up and move to the next level. In some cases, with enough support from partners, it may be time to establish an institutional office for economic development or technology transfer, creating a new cabinet position and investing significant resources to achieve appropriately high expectations.
As is clearly shown in the following chapters, it is critically important to work in partnership with government, business, and community in your region and to engage your own faculty, staff, and students as you settle on your goal and your scope. As we all know, unless your partners (external and internal) share your goals, you will have a difficult time finding support, financial or in-kind, and your efforts may be for naught.

To Thine Own Self Be True.[2] When working with partners in setting goals, there is a real danger of moving in ways that are not aligned with your institution's mission and values. Such efforts are almost certainly doomed to failure. Perhaps a regional leader comes to you after reading about a university in the next state where a university-business consortium has just received a $100 million grant to develop and build the next generation of military drones. Jobs and prosperity will certainly follow. And of course, your institution and community are much stronger and certain to succeed in a similar project. If your faculty, however, has soundly rejected the idea of conducting classified research and development work every time the subject has come up, you will need to be ready to explain why the great idea that worked in the neighboring state isn't the right idea for your institution.

Or perhaps an energy industry executive talks about funding a new engineering building on your campus while providing ongoing funding for research on safe fracking. Your graduates will be able to get high-paying jobs and the region's economy will skyrocket. If your board just established a carbon-neutral initiative and your foundation is divesting petroleum stocks, though, you probably need to think long and hard before accepting the check.

These hypothetical examples may be easy to spot, but real examples are likely to be much more subtle. It's thus critically important to really understand your institution's culture before moving ahead. Make sure to carefully consult and consider before starting an economic development initiative that will move the institution away from its core values.

You Gotta Know the Territory.[3] Just as economic development initiatives should align with your institution's mission, culture, and values, they must also be based on a brutally honest assessment of the core strengths and capabilities of your institution and your region, and an objective analysis of your chances for success. If your institution's research productivity is low, it's probably not a good time to create a new office of technology transfer, and you certainly shouldn't expect licensing revenue to pay for its operation if you do. Perhaps adding undergraduate research opportunities is a better way to start. If your region doesn't have the infrastructure or funding to support new, knowledge-economy businesses, maybe focusing academic programs on educating highly productive workers for existing business will have more immediate success. And if a new business area looks ripe for investment, make sure you assess whether or not you have any existing expertise and check and see if other regions have beaten you to the punch. Trying to catch up from behind or to create expertise from scratch is seldom a winning approach.

Your institution may play different roles, depending on the maturity of its regional economic and workforce-development efforts. If there is not an effective economic development plan in place, then stepping forward to become the leader in convening partners to create and implement a plan, perhaps involving your students to support the efforts as an exercise in engaged learning, may provide the greatest value to your communities. If a strong plan and the structure to support it are in place, then your students, faculty, and academic programs can be brought to bear on relevant goals and initiatives. Even in a region with a well-developed economic development infrastructure, your institution may be able to help the team attract additional investment from state and federal sources.

In all cases, you should help your region's leaders think about two areas in which colleges and universities excel. First, there is a significant difference between preparing graduates for their first jobs and preparing graduates for their careers. The base skills needed today are important, but so are the abilities to

think critically, to be innovative, and to communicate clearly. Lifelong learning is a necessity on which our institutions must focus, just as business leaders must sometimes focus only on the workforce they need today. Second, most workforce-planning agencies build their projections based on the recent past and short-term industry plans. If your region's economy is to do more than just survive, your institution must lead in thinking about the needs beyond the next five years, helping envision industries and jobs that don't yet exist.

Takes Two to Tango.[4] If you take away only one message from this guide, it should be this: Successful economic and workforce development demand working with one or more partners. In this realm it actually is probably more accurate to say that it "takes 22 to tango." The success of your institution's efforts will depend most heavily on the depth and breadth of your connections, the strength and frequency of your communication, and your willingness to work toward mutual success.

(Not) Mine. All Mine.[5] A steward is one appointed to manage the affairs of a master to the benefit of that master. If your institution is to be a good "steward of place," then your efforts in economic and workforce development must remain focused on bettering the condition of the region, your students, and your faculty, in that order. Helping to achieve these portions of your institution's mission should be the aim. If balancing your institution's budget or improving its reputation is the primary focus for new initiatives in economic development, disappointment will be the likely result. Integrating regional engagement into institutional strategic planning, curriculum, and reward structures increases the likelihood of success.

Win-Win (-Win-Win-Win- . . .)[6] All of the partners should benefit from an economic development initiative, and none should engage to achieve only their own ends. It is usually best if all parties are expected to invest something tangible in the partnership—such as funds, equipment, facilities, or time. And all parties must transparently address how they will benefit from the initiative.

The very best results occur if all parties are flexible and willing to adjust their individual goals to ensure significant outcomes for all partners. We must always resist the temptation to say, "we're from the university and we know how to solve your problems," just as your partners should resist saying, "I just need you to teach your students exactly what I say they need to know for a job in my company"

or any of the many similar statements that may come from partners. Planning together should ideally lead all partners to reach new and deeper understanding of the issues, problems, opportunities, and paths to mutual success. In the end, the tone of your discussion should reflect "our" challenges and "our" solutions.

(Not) Breaking the Law.[7] As the authors of this guide make clear, the legal requirements for effectively managing intellectual property, technology transfer, and the like are quite complicated. Similarly, placing students in situations involving undergraduate research, service learning, internships, and practica is fraught with potential risk, and the legal requirements continue to evolve. These complexities are not reasons to avoid new economic and workforce-development initiatives. It is important, however, to be fully informed about the legal requirements and possible risks before moving ahead. This allows you to protect your institution and its reputation from undue harm and to implement appropriate policies and procedures to protect your faculty, staff, and students and their work. You should also include the costs of addressing legal requirements and mitigating risks as you evaluate potential initiatives. This guide contains some useful ideas for sharing and containing costs as you move forward.

Are We There Yet?[8] The contributors to this monograph have provided a number of good ways to measure and report the progress and success of economic and workforce-development initiatives. The measures are many and diverse, as befits the wide range of projects described. They also reflect the breadth of metrics in use nationally by universities, governments, businesses, and consortia engaged in economic development activities. When choosing metrics and targets you should think carefully about what makes the most sense for your university, region, and project. The fundamental question needs to be: What will your stakeholders value as contributions from your institution?

At the same time, I would ask that you consider the possibility for broader application of the metrics you choose. AASCU institutions have a remarkable impact on the economy of our nation, but it can be very difficult to aggregate, describe, and demonstrate their overall impact without a shared set of core metrics. I am hopeful that we can all learn from each other as we work to make the strongest possible case for the return on investment in our institutions by state and federal funders.

Wrapping Up

In 2013-14, the AASCU Committee on Economic and Workforce Development drafted a short statement describing the role of AASCU institutions in economic and workforce development. The statement was endorsed by the AASCU board in July of 2014. Building on the concepts in AASCU's publications *Stepping Forward as Stewards of Place*[9] and *Becoming a Steward of Place,*[10] the statement classified institutional contributions in three broad categories: workforce development for the jobs of the present and the future; technology transfer and new-business development; and institutions as economic engines in and of themselves.

While AASCU institutions have always diligently worked to be strong "stewards of place," in the face of increasing competition, changes in federal and state funding, and growing needs for a more educated, innovative, and entrepreneurial workforce, we must do more. I summed it up in a recent call to action for my own university:[11]

> IUP and other universities like ours have symbiotic relationships with our host regions. We are an integral part of their culture, economic growth, and general well-being. In return, they give our students a place to conduct field work and find solutions to real problems as they work side by side with their professors and grow as citizens.
>
> . . .
>
> It's our duty to prepare students not just for what they will face upon graduation, but for a world we cannot possibly imagine in a decade or more.

I hope that this monograph provides you with some ideas for moving your institution forward in leading economic, workforce, community, and social development in your areas. It has certainly done so for me. I also know that there is much yet to learn, and I encourage you to share your ideas and attempts, your successes and failures with your AASCU colleagues, whether at face-to-face meetings or via the Innovations Exchange at *www.aascu.org/innovations*.

Good luck in your endeavors!

About the Author

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Endnotes

[1]If you know where you are going to, then you might recognize Diana Ross's rendition of the "Theme from Mahogany."

[2]"To Thine Own Self Be True"—pop culture in 1601, pop culture today as young people around the world are using this line from *Hamlet*. Shakespeare would have liked the attention.

[3]Broadway and later film popularized the line "You gotta know the territory" from "Rock Island," a tune from Meredith Willson's *The Music Man*.

[4]Louis Armstong performed "Takes Two to Tango." In addition to the title, a key phrase of the song is, "You can get into debt on your own."

[5]"It's mine. All mine," Daffy Duck declares after finding the treasure and then subsequently insulting the genie in "Ali Baba Bunny"—a 1957 Warner Bros. cartoon.

[6]J.D. Singer used the phrase "win-win" in his 1962 *Deterrence, Arms Control, and Disarmament*. Stephen Covey used it later in *The Seven Habits of Highly Effective People*.

[7]Judas Priest released "Breaking the Law" in its 1980 album *British Steel*.

[8]My children and yours all have asked, "Are we there yet?" Someone on every adventure does.

[9]Votruba, J., et. al. (2002). *Stepping forward as stewards of place*. Washington, DC.: American Association of State Colleges and Universities.

[10]Saltmarsh, J., et. al. (2014). *Becoming a steward of place: Lessons from AASCU Carnegie community engagement applications*. Washington, DC.: American Association of State Colleges and Universities.

[11]Driscoll, M. (2015). *Of mutual benefit,* IUP Magazine. Indiana, PA: Indiana University of Pennsylvania.

Promoting Student Engagement

Elizabeth L. Ambos

Overview

Student success is at the center of successful regional engagement. Thus, the relationship between institutional outreach through the AASCU "stewards of place" paradigm and meaningful student participation in the effort is fundamental to the success of regional engagement.

The roles that undergraduate research, service-learning, and other high-impact practices (HIPs) play in support of community-based and community-driven research are described in this chapter, and the relationship between such practices and regional economic development is examined. Two fundamental models that institutions use to effectively blend student engagement and economic development—the student engagement-business framework and the student engagement-society framework—are illustrated using various campus initiatives as examples. Accompanying the descriptions of individual campuses' successes are the lessons learned from university system-based professional development, including insights about how change can be leveraged in a system context, and how to connect disparate institutional efforts to large-scale regional interests. Additionally, practical advice is distilled about how to successfully institutionalize student engagement and connect it to regional economic development.

It is likely that this chapter could not have been written 10 years ago or even five years ago. Undergraduates as researchers? Seamlessly linking the teaching and learning process with research and economic development? Academic institutions as stewards of place and guarantors of student success? Yes, indeed!

We can draw clear analogies between the AASCU "stewards of place" paradigm (AASCU, 2002; Saltmarsh et al., 2013; Dunfee, 2014), which calls for institutional engagement with communities and regions, and the student-engagement imperative. Institutions' capacities to thrive as regional stewards are only as strong as the opportunities for individuals within the institutions. First and foremost,

all students must succeed. It is this central ethos—that all students must engage, strive, and thrive, in the context of institutional and regional cultures, needs, and opportunities—that is this chapter's focus.

Student engagement is a flexible concept. It embraces a host of strategies, designed to persuade, encourage, and attract students to learning and their own success. Closely matched with the concept of student engagement is that of high-impact practice. In educational research circles, high-impact practices (hereafter, HIPs) are those education strategies and activities that have been shown to be most effective in promoting student success. HIPs lead to quantifiable student benefits, such as increased graduation rates, higher grades, and professional aspirations (Kuh, 2008). Since the promulgation of HIPs as a conceptual framework for student success, numerous follow-on studies (Finley and McNair, 2013; Kuh and O'Donnell, 2013) have sought to understand which HIPs are most effective, under what conditions, and with what level of institutional investment and scaling potential. Although the research on an individual practice's effectiveness is by no means complete, the existing consensus is that the top five HIPs, in the approximate order in which students usually encounter them, are first-year experiences, learning communities, service-learning, undergraduate research, and capstone experiences (Brownell and Swaner, 2010).

Since the connections among research, innovation, entrepreneurship, and economic development are well-established, and federal, state, and corporate investments in research development exist to spur the translation of discoveries to commercialization and job creation, it is not surprising that undergraduate research is emerging as a HIP that can be closely identified with both student and regional economic success. The Council on Undergraduate Research (CUR) has been leading the development of undergraduate research practices (throughout this chapter, the term undergraduate research will be used as an abbreviation for the more inclusive phrase undergraduate research, scholarship, and creative activities) since its inception as a small grassroots association in the late 1970s. It now is a membership-based, non-profit organization providing programs, services, education, and advocacy for more than 10,000 members at more than 700 institutions, many of them AASCU campuses.

Through the process of working closely with the rapidly growing community of undergraduate research practitioners, CUR has developed and published

a set of benchmarks for institutions striving to provide robust environments for undergraduate research. This document, *Characteristics of Excellence in Undergraduate Research* (Hensel, 2012), is informally known as *COEUR*. Since *COEUR's* publication, many institutions have begun to use it as a diagnostic tool to identify gaps in the institutions' cultural development and infrastructure with respect to undergraduate research programs and practices. In 2015, CUR will launch an institutional-recognition program designed to recognize achievement in undergraduate research, scholarship, and creative activities.

CUR has worked with more than 450 academic institutions to provide professional-development opportunities designed to expand, enhance, and institutionalize undergraduate research programs. For the past five years, a grant from the National Science Foundation (NSF DUE 09-20275) has supported CUR's work with STEM (science, technology, engineering, and mathematics) faculty and administrators employed at six different systems or consortia. The six systems included four groups of AASCU institutions: California State University (CSU), the City University of New York (CUNY), the Pennsylvania State System of Higher Education (PASSHE), and the University of Wisconsin (UW). The lessons learned from the system-based professional-development work include insights into how change can be leveraged in the context of a system and how to connect disparate institutional efforts to large-scale regional interests.

As one example, nearly all of the 23 Cal State campuses now have an office of undergraduate research to encourage such projects, especially those targeting low-income and disadvantaged students majoring in the physical sciences and social sciences. Cal State L.A. recently announced a $3.5-million grant from Los Angeles County to fund a 20,000-square-foot laboratory where undergraduate and graduate students will work in conjunction with start-up companies to conduct bioscience research. (Rivera, 2014, p. 1).

Undergraduate Research, Service Learning, and Other HIPs

Among HIPs, undergraduate research can be identified as a "first among equals." It is effective on its own merits, and it successfully connects and enables other high-impact practices, such as service-learning. In fact, one of the fastest-growing trends on college campuses is to blend elements of traditional service-learning

with undergraduate research in support of community-based or community-driven undergraduate research. Undergraduate research and service-learning are two high-impact strategies that have particular significance for considerations of regional economic development, and linking these two HIPs would seem to be a natural pathway for AASCU institutions that are aligning their individual missions with the "stewards of place" paradigm.

Community-driven undergraduate research can be broadly defined as the types of business and industry initiatives that are underway in the Los Angeles basin (eight California State University campuses, all AASCU institutions, are involved). It can also mean work with community foundations, K-12 school districts, non-profits, and state and local governmental agencies. Within the last few years, CUR has published two practitioner-oriented guides that offer many examples of the interplay between community-based research and undergraduate research programs (Cooke and Thorme, 2011; Kinkead and Blockus, 2012). The latter features several chapters written by directors of undergraduate research programs at AASCU institutions. In addition, the Bonner Foundation has engaged a number of private and public colleges and universities, including AASCU institutions such as California State University, Los Angeles, Central Washington University, and The College of New Jersey, in its Bonner Leadership program, which seeks to embed community service-learning into the fabric of an institution's culture. In addition, the Bonner Foundation has sponsored a High-Impact Initiative to more effectively integrate community service and engagement with other HIPs.

Undergraduate research draws on the expertise and passion of faculty members, thus positioning undergraduate research to be the easiest HIP for faculty members to access to continue both their own scholarship and to foster their students' learning and initiation into scholarship. As stated in many publications concerning higher-education reform, only when faculty leaders step forward and are thoroughly engaged in the change process does change occur in higher education (Tagg, 2012).

In addition to the ample benefits afforded institutions by seamlessly connecting faculty and student learning, support for undergraduate research can be leveraged through grants and contracts from sources outside of the immediate campus. Although all of the HIPs have the potential to garner support from donors, no other HIP has the realistic prospect of acquiring federal grants on the same

scale as undergraduate research. Federal investments in research and research training are potential sources of support for AASCU institutions searching for ways to leverage scarce internal funds. Several federal agencies offer funding for undergraduate research activities. These include the National Science Foundation's Research Experiences for Undergraduates (REU) program; the National Institutes of Health's Building Infrastructure Leading to Diversity (BUILD); its Research Initiative for Science Enhancement (RISE); the Institutional Development Awards (IDeA); Networks of Biomedical Research Excellence, (INBRE); the Bridges to the Baccalaureate and Bridges to the Doctorate programs; and the Department of Education's Ronald McNair Post-Baccalaureate Scholars and Title V STEM program.

Student Engagement and Student Success: Positive Impact for Underrepresented Students

In the last decade, the peer-reviewed literature on HIPs' impacts has burgeoned. Some recent publications that highlight the importance of undergraduate research include Osborn and Karukstis, 2009; Lopatto, 2004, 2009; Laursen et al., 2010; and Eagan et al., 2013. Three main positive outcomes are attributed to undergraduate research: (1) increases in students' professional aspirations, particularly with respect to post-baccalaureate advancement (Hathaway et al., 2002; Bauer and Bennett, 2003); (2) increases in students' self-efficacy and resilience (Ishiyama, 2001; Crowe and Brakke, 2008); and (3) development of core skills desired by most employers and graduate and professional schools, such as critical thinking, innovation, oral and written communication, and teamwork (Seymour, Hunter, Laursen and DeAntoni, 2004; Hunter, Weston, Laursen, and Thiry, 2009; Singer and Zimmerman, 2012; AAMC, 2014; Laursen, 2015 (in press)).

One of the most intriguing and timely research domains addresses HIPs' beneficial impact for students from underrepresented groups, especially minority and/or first-generation students (Nagda et al., 1998; Ishiyama, 2001; Hurtado et al., 2009). Given the focus on raising college retention and graduation rates, as well as the need to close achievement gaps among ethnic/racial and/or socioeconomic groups, investment in strategies that do both is highly merited. Indeed, a study conducted by Bettina Huber, institutional-research officer of AASCU member California State University, Northridge (2010), indicated that high rates of participation in multiple HIPs can result in not only the closing of achievement

gaps among ethnic, racial, or socioeconomic groups, but also a phenomenon I would call "vaulting over," when students from underserved or underprepared groups may surpass retention and graduation rates of more advantaged groups. The "vaulting over" phenomenon has been subsequently replicated in studies conducted by the American Association of Colleges and Universities (Finley and McNair, 2013).

Strategies that Work: Connecting Student Engagement with Regional Economic Development

There are two fundamental models that institutions are using to effectively blend student engagement and economic development. One model integrates student engagement practices, principally undergraduate research, into work directly supporting regional businesses and industries. This approach is found most commonly in the engineering and STEM (science, technology, engineering, and mathematics) disciplines, and may incorporate other HIPs, such as internships or capstone experiences. Concepts attached to this first model, which we might call the "student engagement-business framework," include workforce development, job creation, and the translational/entrepreneurial economy.

The second model seeks to connect student engagement with societal challenges and community needs, and might be termed the "student engagement-society framework." This alternative model tends to involve the humanities and social and health sciences and may incorporate elements of community service and clinical practice. Concepts attached to the latter model often include social justice, health, sustainability, and well-being. Naturally, blends of these two models exist, particularly at campuses that have developed a deep and broad portfolio of programs for student engagement.

The California-based program described above clearly fits the "student engagement-business" model. So, too, does the undergraduate research in petroleum engineering program at the University of Louisiana at Lafayette, which is supported by clients in the petroleum industry. Programs at AASCU institutions in Virginia, including James Madison University, which has initiated a biotechnology incubator that connects undergraduate researchers with biotechnology companies, and George Mason University, where bioengineering

students undertake research on the use of technology to reduce chronic pain, also clearly identify goals involving both student success and business creation and/or support. A communication from the faculty leader of the George Mason University initiative, Siddhartha Sikdar, illustrates the deep connection among undergraduate engagement, research productivity, and commercialization:

> We currently have a major NSF-funded research initiative in my lab involving multiple faculty on developing a novel ultrasound-based control strategy for upper extremity prostheses. This work started out as an undergraduate senior design project, and several undergraduate researchers are co-authors on a journal paper and co-inventors on a patent application describing this work. This work is now blossoming into a number of new collaborations with partners outside of Mason, and undergraduate students continue to be a big part of the research.

Examples of the student engagement-society framework include the following: studies of transitional housing needs for rural/suburban domestic-violence survivors (Mekolichick, Davis, and Chouinard, 2008), conducted by sociologists at Radford University in Virginia; community-based research in Trenton, New Jersey, conducted by psychology students and faculty mentors at The College of New Jersey (Chung and Probert, 2011; Chung and Docherty, 2011); and the collaborative work between undergraduate social-work students at George Mason University and the Campus Kitchens Project, a non-profit that aims to address food security and nutrition issues in the Washington, D.C., area (Kamath, 2014).

A large part of this engagement domain is devoted to environmental issues as illustrated in the following projects:

- Undergraduate researchers at the State University of New York, Buffalo State are involved in the study and restoration of the Buffalo River (Singer, Atkinson, Manley and McLaren, 2008).

- Students at Bloomsburg University in Pennsylvania are conducting research on the Susquehanna River (Hranitz, 2013).

- At-risk coastal fishing stocks are monitored and assessed by teams of student observers from the California Polytechnic Institute, San Luis Obispo, working with faculty scientists and local fishermen (Wendt and Starr, 2009).

- Northern Arizona University students, faculty, and staff are creating a four-year learning laboratory on campus involving regional sustainability (Parnell, Berutich, Henn, and Koressel, 2014).

One of the largest and most comprehensive catalogues of community-engaged practices is published annually by the California State University Chancellor's Office (Center for Community Engagement, 2013), and includes a wealth of student engagement-society examples.

In a recent communication from Dean Jeffrey Osborn of The College of New Jersey, he described a typical student engagement-society project:

> Students are conducting research with Professor Monisha Pulimood, Chair and Associate Professor of Computer Science, and those in her classes are incrementally designing and developing a system called SOAP (Students Organizing Against Pollution) to provide information related to brownfields in the Trenton area. A primary goal is to enable Dr. Caruso, Executive Director of Habitat for Humanity, to gauge how much it will cost to clean up a site, based on chemicals predicted to be present in the soil. A broader goal is for the site to raise awareness about cumulative health impacts of pollutants and to empower citizens to become self-advocates. The site is at *http://tardis.tcnj.edu/cabect/SOAP/index.php/*.

The student engagement-business framework and the student engagement-society framework are equally important to economic development. Regions cannot thrive economically without improvements to community services and programs for their citizenry—part of the social compact that connects diverse community participants, reduces inequities, repairs the social fabric, and increases overall health and wellness. So, too, regions cannot thrive without innovation, formation of new business opportunities and start-up companies, and robust job creation (and retention) strategies.

Universities have created diverse organizational structures to integrate student research and economic growth. Describing an Indiana University (2013) project, Karen White and her colleagues begin with the provocative question: "Can the drive to make universities 'engines of economic development' and the mandate to improve student engagement and retention co-exist?" A successful program at Indiana University-Purdue University Indianapolis does just that, combining collaborative research and entrepreneurship. This program, Innovation to Enterprise Central (ITEC), began in 2011 and provides funding for multiple student teams to help translate a faculty or student research project from concept to business enterprise.

In another example, the Clemson University Creative Inquiry (CI) program (Speziale, 2013) began in 2005. To date, CI has supported more than 700 interdisciplinary, course-based research projects involving multiple faculty and student teams.

The University of Wisconsin-Milwaukee (Van Galen, Schneider-Rebozo, Havholm, and Andrews, 2015) is one of several University of Wisconsin campuses that has embraced the linkage between undergraduate research and economic development. With support from the National Collegiate Inventors and Innovators Alliance (NCIIA) and the University of Wisconsin system's Growth Agenda for Wisconsin Program, the University of Wisconsin-Milwaukee's Startup Challenge is a contest-based format that exclusively supports student research and entrepreneurship.

Knocking Down the Barriers to Institutionalizing Student Engagement

The solemn statement that "change is difficult" is often embraced as a truism within the halls of academe. Nonetheless, examples of campuses that have changed their culture and practice to emphasize student engagement and connection to regional stewardship and economic development certainly exist. What are the challenges that these campuses have faced, and how can other institutions learn from their examples? It is useful to review two common pitfalls in constructing change in student-engagement practices and show examples of institutions that have successfully advanced the change process.

Changing Institutional Culture and Belief Systems. There are some deeply held beliefs about student engagement that may stymie institutional efforts to embrace it as the preferred learning pathway. With regard to undergraduate research, for example, a not uncommon assertion is that undergraduate students are not prepared to do meaningful research. Another sentiment is that undergraduate research, internships, or service learning cannot and should not replace coverage of content in courses. Less commonly heard, but still voiced in some circles, is the idea that faculty roles and responsibilities at some institutions do not include any activities outside of the classroom, such as community volunteerism or original research, and that these activities, therefore, should not be present in the teaching process. Although these beliefs have been effectively challenged in a number of published accounts (Greever and Gallian, 1995; Karukstis and Elgren, 2007), they can often only be thoroughly discounted after deep changes in attitudes and structures, particularly through changes in faculty, student, and institutional reward systems, and comprehensive curriculum redesign. An example of an AASCU institution that has successfully changed its culture to emphasize student-engaged, research-based curricula is The College of New Jersey (Flaherty, 2014). In this institution, the decade-long transformation of curriculum, the culture of faculty rewards, and institutional identity is described as "a radical overhaul of the curriculum, centered on undergraduate research and the teacher-scholar model. . . . The faculty members say . . . they're credited for how much work they do, and what kind. That, in turn, encourages them to take risks in their research and teaching in ways that help students."

Operational Issues: Policies and Practices. If the academic culture at an institution has moved to embrace a student-engagement model but still faces impediments to the change process, they are likely to be at the operational level and related to the details of policy, patterns of resource distribution, and design of infrastructure particular to the institution. A comprehensive policy audit may be in order to determine whether there are disconnects between the direction in which the institution wants to go and the details governing how the institution actually operates. Are there penalties to using classrooms in off hours for research? Are charges levied on community groups that are on campus for cooperative events? What about liability issues with respect to community partnerships, service learning, and internships? Are faculty members allowed to accrue "credit" for teaching smaller seminar courses that focus on the research process or involve

service-learning opportunities? Can faculty team-teach easily, thus leading to interdisciplinary course-based research that can address community issues? Are federal work study funds and other sources of student support applied to support student engagement in service learning and/or undergraduate research? Does the research and sponsored-programs office have an incentive program to support acquisition of external grants targeting service learning, undergraduate research, or other types of student engagement? These are the types of questions that institutions should ask if it seems as if the will to change is present but the implementation is running into difficulties. These questions are routinely addressed in CUR professional-development institutes, and many strategies for addressing faculty policy and incentive issues are presented in Hensel and Paul (2012).

One AASCU institution that has successfully changed infrastructure to emphasize student engagement is the University of Central Oklahoma (UCO). In their 2014 article, John Barthell and colleagues describe how they furthered their institutional development by analyzing their existing processes in terms of "return on investment" (ROI) and long-term fiscal sustainability. In UCO's case, the primary lens through which they examined ROI was faculty enhancement, particularly in garnering external funding to support the institution's teaching, research, and service activities in the surrounding region. Through adaptation and implementation of a successful model that was operational at another AASCU Institution, the University of Wisconsin-LaCrosse, they were able to increase the amount of externally funded research and sponsored programs, and also to monitor increases in grade-point averages and retention for a cohort of students involved in first-year research experiences, compared to a group of peers without those experiences.

Toward a More Perfect Union: Advice for Leaders on Connecting Student Engagement to Regional Priorities

For those AASCU institutions seeking to advance their roles as "stewards of place" through building in student engagement as a central practice, attention to the following three actions will help institutions make substantial progress in linking student engagement with economic development.

Seek Synergies. Wherever possible, connect student engagement, particularly through the unifying concept of community-driven research, to both the diverse elements of the university that support HIPs and to the external community's needs. One specific tactic that academic leaders may wish to consider is either consolidating or closely locating separate offices or functions such as service learning, undergraduate research, student services, undergraduate programs, and faculty professional-development centers. This will help resist the formation of silos and build coalitions across the campus more effectively. Radford University in Virginia has created the Office of High Impact Practices, which houses international education, a scholar-citizen initiative, undergraduate research, and honors programs. Similarly, San Diego State University has an Academic Engagement Office (AEP) for High Impact Practices, which includes under its umbrella the institution's Common Experience (a unified themed curriculum), the Faculty-Student Mentoring Program, the Service Learning and Community Engagement Program, the Undergraduate Research Program, and the Undergraduate Studies Internship Program *http://dus.sdsu.edu/dus/academicengagement/about.aspx* .

Engage Multiple "Nested" Stakeholders. Faculty members are leaders supervising undergraduate research and mentoring students engaged in service learning, but many other groups of stakeholders on campus can be effective champions and leaders in student engagement. The foremost champions are the students themselves. They can be authentic evaluators and opinion-makers when it comes to defining the nature of the student engagement, as is the case at the University of Central Florida (Pita et al., 2013; Showman et al., 2013). Student services professionals are experts in student development in higher education and are another group that can be involved in deepening student engagement. At San Diego State University, the AEP noted earlier is led by a staff professional deeply engaged with the community. Other non-faculty stakeholders on campuses who can be focused on greater student engagement include coordinators of undergraduate research, service learning, honors, and internship programs. Experts in governmental affairs and economic development are key leaders within the University of Wisconsin undergraduate research collaborative (Van Galen, Schneider-Rebozo, Havholm and Andrews, 2015).

The deliberate recruitment of multiple stakeholders to support greater student engagement provides overlapping and "nested" leadership for campus initiatives. Inhabitants of administrative positions tend to change rapidly, and new initiatives and strategic priorities shift over time. By forming a robust, diverse, and universitywide coalition of leaders, momentum toward expanded support for student engagement can continue.

Measure What You Value/Value What You Measure. As many public institutions transition from enrollment-based funding to (at least in part) outcomes-based funding models, the importance of measuring outcomes looms large. In addition to the previously mentioned positive correlations among student engagement and retention, improved grade-point averages, and fewer years to graduation, institutions are seeking other evidence that investment in HIPs pays off. Institutions may count presentations and publications of scholarly work involving students (e.g. Barthell et al., 2014); numbers of hours of student engagement in service learning (Center for Community Engagement, 2013); and students' success in post-baccalaureate education. Many AASCU institutions have conducted detailed longitudinal studies of undergraduate researchers who have gone on to graduate school. Researchers at the University of Maryland-Baltimore County (Maton, Hrabowski and Schmitt; 2000) and California State University, Northridge (Plunkett, Saetermoe and Quilici, 2014) have provided particularly detailed longitudinal assessments of cohorts of student researchers.

The Ultimate "Win" of Student Engagement

Perils exist for institutions that don't foster and intertwine student engagement and economic development. Higher-education institutions that are drawing students from the surrounding community, yet neglecting to engage them in meaningful study tied to regional interests and failing to retain and graduate them, are not helping their regions. Their students may leave the region for greener pastures, a loss to the region's economy and vitality. If institutions thoroughly ramp up both student engagement and regional economic development and services, the "stewards of place" paradigm can flower in multiple ways. An emerging strength of many colleges and universities that celebrate and thoroughly embrace the research-driven "stewards of place" paradigm is that students remain in the community after graduation. If institutions function as net importers of college-

educated, community-supporting, civically oriented, taxpaying citizens in their regions, surely there is no greater achievement!

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Aligning Faculty and Curriculum Development with Community Priorities:

A Model for a Department-Invested Partnership

Emily M. Janke and Terri L. Shelton

Overview

In this chapter, we discuss a case study of a successful and enduring faculty-initiated partnership between an academic department and a city agency. In describing the landlord-tenant dispute program, we outline how the program was established, the infrastructure needed, and lessons learned. The chapter then goes on to present a conceptual mapping tool that can be used by faculty and staff with their community partners to identify key areas for alignment to ensure mutually beneficial ways to institutionalize a partnership. The mapping tool examines the priorities of both the academic department and the potential or current community partner. It addresses six fundamental questions to help align the priorities of the department and the community partner to ensure that the partnership is not only successful but enduring. The alignment leads to ensuring that the academic priorities (faculty scholarship, courses and experiences, and students' learning outcomes) are aligned with the community partner's priorities (organizational objectives, programs and services, and partners' responsibilities/agendas). At the center of the map is the activity or program that results to form a mutually beneficial partnership. The chapter ends with a summary of metrics to evaluate the success of the landlord-tenant dispute program. We also highlight the impact on students, the department, and the city agency.

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Increasingly, institutions of higher education are expected to play an active role in the economic health of their city, region, or state. Being a "steward of place" (AASCU, 2002) with regard to economic vitality includes not only the role that higher education plays in providing an educated workforce that has the skills to be successful, but also the economic impact that emanates from faculty scholarship and student applied learning experiences.

Faculty engagement for economic prosperity often occurs through individually established relationships wherein a faculty member works with an external partner toward some defined activity, such as a service-learning course or community-

based research project. Examples of individual faculty members establishing partnerships that serve teaching and research agendas dominate the service-learning literature, as well as practice on many campuses.

Large scale efforts are often spearheaded by university and local political leaders with varying degrees of involvement by faculty or students. These efforts may include the work of university centers, such as the Center for Youth, Family, and Community Partnerships at the University of North Carolina at Greensboro. The center encourages community-engaged, interdisciplinary research that builds the capacity of families, service providers, researchers, teachers, and communities to bridge research, policy, and practice to ensure the health and well-being of children (Shelton and Frabutt, 2006). Similar to many university centers, it is administered largely by professional staff, but also provides significant learning experiences for students through applied research, internships and volunteering, and enduring partnerships with faculty members centered around teaching, interdisciplinary community-engaged research, and service. Established in 1996, the center has longstanding relationships with local and regional community partners, providing an invaluable foundation that can be leveraged by students and faculty members as they build their unique partnerships.

Other examples of institutional-level community-campus initiatives include such higher education projects as:

- The Connective Corridor at Syracuse University that provides opportunities for faculty and students to engage in multidisciplinary research and pedagogy through community-engaged projects.

- The Port Richmond Partnership at Wagner College that addresses the complex needs of immigrant populations in the areas of health care, education, housing, and employment, and engages a large number of students in curricular and co-curricular experiences.

Each of these examples represents institutional partnerships established by executive leadership and coordinated largely by professional staff. But even these organization-wide initiatives facilitate some degree of faculty and curricular development. Arguably, most community-university partnerships fall into the two types discussed here: individual and institutional-level partnerships.

Faculty, administrators, and community-engagement scholars have begun to advocate for broadening partnerships across disciplines, adding community participants, and aligning projects more closely to curricular priorities. To this end, some have called for community-campus partnerships that are embedded within academic departments' activities and priorities (Janke and Clayton, 2015; Battistoni, Gelmon, Saltmarsh, Wergin and Zlotkowski, 2003; Kecskes, Gelmon and Spring, 2006; Furco, 2002; Holland, 1997; Kecskes, 2006). Alignment with areas of work responsibilities at all levels (individual, departmental, institutional) and within each partner's core roles and responsibilities (academic and community roles) can help leverage the mutually beneficial efficiencies and effectiveness that come from intentional integration. Embedding activities into the operation of the core functions of the departments and organizations also supports the long-term sustainability of the partnership.

The presence of engaged departments (Kecskes, Gelmon and Spring, 2006) is considered to be an indicator of successful institutionalization of community engagement within a college or university (Furco 2000, 2003; Gelmon and Seifer et al., 2005; Holland, 1997; Kecskes and Muyllaert, 1997). This includes alignment with institutional mission, faculty policies and practices, engagement by community partners and students, and administrative support (Kecskes, 2006). Engaged departments may contain individual faculty members who are each fulfilling their own community-engaged scholarship agendas through teaching and research. They may establish collective commitments to a limited number of partnerships and projects, bringing together threads of faculty service and curricular-development agendas into a single tapestry.

This chapter first presents the work of a department-invested partnership that serves as an example of a successful and enduring initiative between an academic department and a city agency. Then this chapter presents a conceptual mapping tool that can be used by faculty and staff in institutions of higher education, along with their community partners, to identify key areas for alignment to ensure mutually beneficial ways to institutionalize an initiative. To demonstrate how this might be used, we apply the Mapping Alignment of Priorities in Department-Invested Partnerships (MAPDIP) tool to the Greensboro's Landlord Tenant Dispute Program (LTDP). We suggest that by having key conversations about areas of work, roles, and priorities, partners are able to establish a "partnership identity" at the department level, a useful development if partnerships and initiatives

are to endure over time and be capable of managing changes to the personnel involved in the partnership. Continuity in partnerships and programs is essential for transformative community and economic engagement; embedding relationships and activities in faculty roles and curricular offerings is essential.

The Greensboro Landlord-Tenant Dispute Program

The Greensboro Landlord-Tenant Dispute Program (LTDP) is a voluntary program that provides opportunities for landlords and tenants to eliminate communication barriers and work together to find solutions through conciliation, rather than litigation. Conciliation provides brief consultation to assist the parties in making informed and thoughtful decisions through active inquiry, asking clarifying questions to elicit the concerns, needs, and requests from the parties to the dispute. Conciliators are individuals who are neutral in a dispute and who are trained to help parties come to their own conclusions, identify choices, and make their own decisions. In this program, students at the University of North Carolina Greensboro (UNCG) and Guilford College serve as conciliators.

The LTDP was established in 2010 when the division manager and fair-housing specialist in the City of Greensboro's Human Relations Department approached a faculty member at the University of North Carolina at Greensboro's Peace and Conflict Studies (PCS) Department (formerly the Program in Conflict Studies and Dispute Resolution) asking for help in addressing the large number of calls their office was receiving about landlord-tenant disputes. In 2012, the LTDP partnership expanded to include the Conflict Resolution Resource Center at Guilford College.

As is the case in most cities, the Fair Housing Division within the City of Greensboro's Human Relations Department is responsible for enforcing federal (i.e., the Fair Housing Act), state, and local laws intended to prevent housing discrimination based on race, color, sex, national origin, religion, familial status, or disability (federally and state-protected classes). City staff members receive a large volume of calls, some of which require investigation regarding fair-housing practices, as required by the federal Department of Housing and Urban Development (HUD), while others require active listening and conciliation skills. Federal law requires discrimination-related cases to be investigated within 100 days; other calls can be transferred to trained voluntary conciliators. The LTDP is a joint program created respond to all non-discrimination-based calls.

Initial Conversations. As a graduate of the PCS master's program, the division manager who made the initial contact with UNCG was aware of the potential mutual benefit to be gained as a result of engaging students as conciliators. Students took classes in facilitation, mediation, and principled negotiating, key competencies for conciliation. They also engaged in practicum experiences. It was felt that students could help to alleviate the workload of the city fair-housing specialist by responding to non-discrimination-based calls.

Providing applied experiences to students was important to the PCS faculty, as well. Students received academic training about evidence-based best practices to prepare them to be dispute-resolution practitioners, program developers, and policy makers. The agreement with the city provided an opportunity for ongoing practice for students within and outside of course work. It also aligned with scholarly interests of the lead faculty member, who served as the service-learning faculty fellow in the university's Office of Leadership and Service-Learning. In addition, the fellow's scholarship examines research, practice, and pedagogy in conflict resolution and peace building through community engagement, particularly as it relates to mediation. Thus, individuals who had an existing relationship and an understanding of the functions and structures within the others' organization made the initial connections for the program.

Planning the Program. To develop the LTDP, a faculty member in the PCS department at UNCG and the director of fair housing in Greensboro's Human Relations Department convened a series of meetings over two years. First, they met with two other nearby city and county governments (the Charlotte-Mecklenburg Community Relations Committee and the Winston-Salem Human Relations Department) that had similar programs in place to address tenant and landlord disputes. These local colleagues urged them to include a wide range of stakeholders involved in housing-related issues. Most importantly, these stakeholders included tenant advocacy and housing-related advocacy organizations, as well as landlords and landlord associations, legal-aid personnel, local magistrates, and the chief district court judge (Hayes et al., 2012). The partners also received a grant from the Community Foundation of Greater Greensboro to design, develop, and evaluate the program. The grant provided partial funding for some initial operating expenses, a student program coordinator, training of student volunteer conciliators and mediators, and an initial evaluation of the program after one year (Hayes et al., 2012).

Infrastructure, Intake, and Referral. The LTDP follows a three-step process that involves communication among the city housing staff, the university and student conciliation coordinators, and the individuals experiencing the conflict. The processes include intake and referral, conciliation, and reviewing and accounting of services provided by the program. The LTDP officially is offered by the City of Greensboro's Human Relations Department as a voluntary referral program. Staff members in the city's housing department answer calls made to the main office line and listen to callers to understand their key issues and determine whether an investigation by the fair-housing specialist may be required. Those calls not involving discrimination based on a protected class that require additional assistance are referred to the LTDP as a voluntary option.

The technical "connective tissue" between the city and student conciliators at UNCG and Guilford College is a Google Drive folder, an online document-sharing platform created and managed by student coordinators and the UNCG Peace and Conflict Studies Department's administrative staff member. The Google Drive folder consists of the original intake referral form from the city, resources for students such as scripts on how to make the initial contact, and resources provided by the North Carolina Bar Association about legal rights and other housing-advocacy programs and services. Students, with faculty oversight, developed these resources. Notes related to cases received by city staff members are recorded in an intake form and submitted via the Google Drive to the LTDP coordinator. The student coordinator monitors the folder for any new cases and assigns them to student conciliators for follow-up.

Conciliation. To be eligible to be a conciliator, students must be enrolled at UNCG or Guilford College and participate in a half-day session led by the city fair-housing specialist and co-hosted by UNCG and Guilford College faculty and student coordinators. In the session, students learn about fair-housing policies and laws, typical cases received by the LTDP, logistics for being assigned and responding to calls, and available resources. In the practice script students receive, students are trained to reiterate that the service is entirely voluntary and that legal advice cannot be provided.

Students contact landlords and tenants by phone. Although the LTPD was initially designed to conduct face–to-face mediation of disputes, evaluation of the program by the academic and city partners recognized that the process was operating

effectively as a telephone-based conciliation service with a range of follow-up options (Hayes et. al., 2012). To make calls, conciliators may use their personal phones, a university department phone, or set up a free online (Google) phone service. Because the conciliation is telephone-based, online students living outside of Greensboro can be involved.

In some cases, the conciliator may help reduce obstacles to communication by calling the other party, typically the landlord, with the permission of the person lodging the complaint, to clarify the needs, expectations, and requests of the complaining party. Most calls require 30 to 60 minutes of active listening with the caller, while some complaints can take days and even weeks of contacts.

Tracking and Accounting. The LTDP is integrated into the workflow and accountability systems of the city. The calls are received and screened initially by city staff members who later provide further follow-up if necessary and review the responses provided by the LTDP conciliators. Using Google Drive to document and share notes about contacts with callers allows city staff members to understand the issues raised, the parties involved, whether the dispute is active or closed, whether and how disputes were resolved, and the form of resolution. Tracking the calls helps the city to understand the resources (such as time, personnel, and information) needed to provide sufficient services to Greensboro stakeholders. (A more in-depth, chronological discussion of the development of the program can be found in Hayes, Witty and Nunn (2011 and Hayes et al. (2012).

The vast majority of calls routed by the city to conciliators in the LTDP come from tenants. Issues tend to fall into four categories: housing (e.g., eviction, lease, foreclosure); financial (e.g., security deposits, rent, bills); health and safety (repairs, mold, air conditioning, bugs and vermin); and interpersonal issues and lease policies (e.g., lease language, policy enforcement, neighbor problems, communication) (Hayes, Roberts, Witty and Nunn, 2012). The majority of LTDP-referred cases are resolved by helping tenants to create a communication plan to address concerns directly with the landlord (Hayes et al., 2012). It is understood that the LTDP does not provide legal advice of any kind, mediate cases involving criminal charges, or provide housing relocation services.

Advice for Leadership: Mapping the Alignment of Interests and Priorities

This section presents a mapping tool to examine alignments among students' learning outcomes and curricula, faculty scholarship, and community work and priorities. The Mapping Alignment of Priorities in Department-Invested Partnerships (MAPDIP) tool was developed and used by the lead author to explore why and how academic departments can choose partnerships to support specific priorities. The tool was developed with the author's colleagues within the Peace and Conflict Studies Department and with other departments' faculty members. Understanding the key areas for aligning academic-community priorities may be instructive to others who seek to engage faculty and curriculum development for mutually beneficial community prosperity and academic outcomes.

Mapping Tool. The MAPDIP tool *(see Figure 1)* examines the priorities of both the academic department and the potential or current community partnering group or organization. This tool raises six foundational questions about individual, department, and institutional alignment and mutual benefit among partners and partnering organizations:

1. Does the activity address something that the community partner has identified as an organizational goal?

2. Can the activity be integrated within existing or soon-to-be-developed activities or programs offered by the community partner?

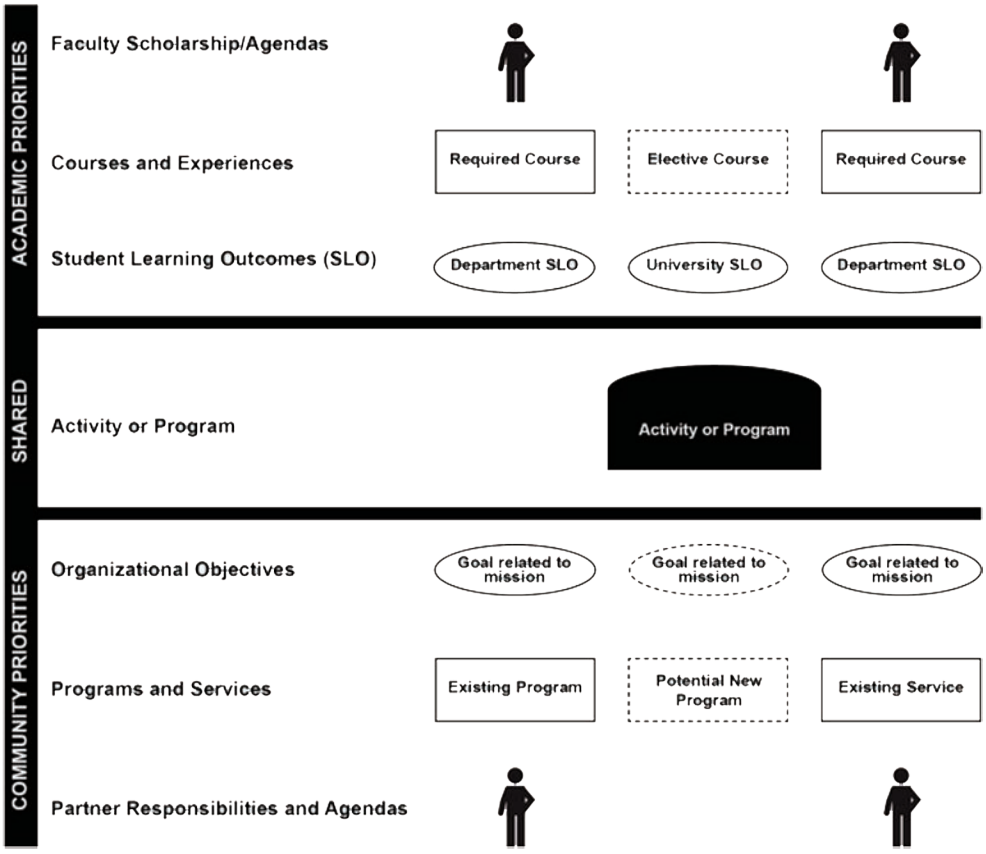
3. Does the activity align with the responsibilities and agendas of the individual community partner?

4. Does the activity align with academic student-learning outcomes?

5. Can the activity be integrated within existing or new required or elective courses and experiences offered by the department to students?

6. Does the activity align with individual faulty members' teaching, research, inquiry, and service agendas?

Figure 1. Mapping Alignment of Priorities in Department-Invested Partnerships (MAPDIP)



Source: Institute for Community and Economic Engagement, University of North Carolina at Greensboro.

Individuals working with the mapping tool may choose to begin from the center out, particularly if they are examining a currently existing partnership and project, and they wish to understand the alignments or gaps in alignment. However, one may complete the map in any order. The mapping approach assumes that there can be a common initiative that meets different objectives and priorities for different stakeholders.

At the center of the map is the activity or program. This segment describes what types of actions currently exist or could be established in the future, and it represents the work or services that the partners are doing together. The LTDP-

provided conciliation services are an example. Other examples might be student tutoring, undergraduate or graduate research projects, or other forms of engaged student learning.

The value of the mapping approach is that it supports an examination of the project from every angle. The following issues should receive primary attention when using the map:

Mapping Academic Priorities. The academic portion of the map describes the core work activities of faculty within their departmental homes that may have a direct or indirect connection to some aspect of the partnership or project. Embedded within an institutional context, the department's objectives and priorities are also affected by and are likely to include university- or college-wide objectives and priorities. To examine projects and related partnerships through the alignment of department and community priorities, it is critical to identify alignment among the following components: student- learning outcomes that can be or are achieved through the activity or program; core and elective courses connected to the activity or program; and the names of faculty who have scholarly agendas, including teaching, research, creative activities, and service, that are connected to the focus of the activity, course, or partner. The community portion of the map contains the following elements: objectives connected to the group or organization's mission; programs and services that are currently or could be offered; and responsibilities and/or agendas of the community partner's organizational role or position.

Activity or Program. The activity or program consists of those actions or services provided. In the LTDP, students provide conciliation services to landlords and tenants as an additional service provided by the city's Human Relations Department and two local institutions of higher education.

Students' Learning Outcomes. Students' learning outcomes describe the desired learning objectives of an educational experience. These may involve educational, societal, professional, or personal outcomes. Learning outcomes are typically created for individual courses and also more broadly to relate to departmental objectives and university requirements for graduates (e.g., general education learning outcomes).

An important student-learning outcome in the PCS program is developing a transformational approach to conflict. Conflict transformation focuses on the deeper relationship patterns that form in the context of a conflict through constructive change initiatives that include and go beyond the resolution of particular problems (Lederach, 2003). Faculty at both UNCG and Guilford College viewed the LTDP as a manifestation of their departments' commitments to high-quality, community-engaged student learning and professional development, and to faculty scholarship and service (J. Rinker, personal communication, November 6, 2014).

Courses and Experiences. Courses and experiences describe the primary ways that faculty within the department provide curricular or co-curricular experiences to address desired outcomes for student learning and development. These may be courses required by the department or experiences that students elect to undertake. Tying the partnership to courses or other experiences helps to ensure more consistent student involvement in the program and raises the probability that faculty members teaching the course will sustain the experiential and partnership aspects of the course.

At various times, the LTDP was connected to student learning at UNCG via required graduate-level practicums and courses, such as Conflict Research, Skills and Techniques for Conflict Transformation, and elective independent studies. At Guilford College, undergraduate students were involved through the Conflict Resolution Resource Clinic; some Guilford students receive internship credit, while others are engaged as volunteers.

Faculty Scholarly Agendas. Faculty scholarly agendas are those priorities and pursuits that faculty strive toward as part of their academic work. These often include some combination of teaching, research (or other forms of inquiry or creative activities), and service to one's department, university, discipline, and public communities. Faculty members whose scholarly agendas align with some aspect of the project and/or partnership are most likely to benefit from, and thus invest most deeply in, the partnership. At the onset of the LTDP, the activity aligned very closely to the founding faculty members' teaching and scholarship. Since then, the alignment has not been as closely tied to a single faculty member's scholarly agenda, although it has served as fertile ground for the scholarship of new faculty joining the department in recent years, including the lead author.

Community Priorities. The community portion of the map describes the core work of staff or members of the community group or organization with which the department is collaborating and is work that may have a direct or indirect connection to some aspect of the partnership or project. Community is not defined by sector, such as private or public, for-profit or nonprofit; rather, community is broadly defined to include individuals, groups, and organizations external to campus that use collaborative processes for the purpose of contributing to the public good.

Organizational Objectives. Organizational objectives are those ends toward which the partnering organization strives. Objectives are often related to the provision of services, such as the conciliation services provided by the LTDP. A key objective of the city's Human Relations Department is to provide quality and timely service to Greensboro residents. The LTDP increased the quality of the services offered while also reducing the city's workload of cases not related to discrimination.

Programs and Services. Programs and services are the activities that are currently being or could be offered by the community partner. In the example of the LTDP, the city was already responding to calls related to landlord-tenant disputes. Therefore, the LTDP was established as a new program within an existing structure to address a previously unmet need. Describing LTDP in this way helps partners understand whether increased efficiencies or effectiveness in achieving desired outcomes may be gained through adding onto or modifying an existing effort or whether an entirely new structure is preferable.

Partner Responsibilities and Agendas. Responsibilities and agendas describe those duties or interests held by each community partner. Alignment to a community partner's organizational roles or agenda is an important consideration because, as with faculty projects, the more the activity aligns with existing priorities, the more attention it will likely receive from the partner and the greater the likelihood a successful initiative will be sustained.

In the LDTP example, responsiveness was a critical piece of the city's goal for customer service. Therefore, the fair-housing director, whose responsibility it was to respond to calls, chose to invest more heavily in the LTDP.

Alignments and Gaps. Best practices in community-university partnerships suggest that partners agree upon missions, values, goals, and measurable outcomes, as well as shared accountability and assessment processes. High-quality partnerships are characterized by mutual trust, respect, reciprocity, mutual benefit, shared power, and effective communication (CCPH, 2013). Added to this is the importance of alignment across key areas of the organization's work roles, responsibilities, and priorities (Holland; Furco). The greater the alignment among students' learning outcomes and courses and faculty scholarly agendas, the greater the department's investment in the partnership and activity. Further, the greater the alignment between the department's objectives and the university's vision, mission, and strategic objectives, the greater the likelihood the effort will be sustained, even with significant personnel changes.

Likewise, the greater the alignment between the community organizations' objectives, programs, and services and the partners' responsibilities and agendas, the greater the community organization's investment in the partnership. Similarly, the greater the partnership's alignment with larger organizational strategic plans, the more likely it will be continued. Initiatives that have significant gaps within the various levels should be examined to consider whether additional investments should be made to align the project with department priorities or whether the project and/or partnership should be replaced by another that satisfies academic and community priorities more completely.

Broadening the Partnership

Partnerships that involve more than a dyad of partners (for example, one faculty member and one community partner) may be more likely to endure significant changes in partnership personnel. While the mapping tool describes investment at the department level, others beyond department faculty may be critical to sustaining successful partnerships, activities, and mutually beneficial outcomes, as was the case with the LTDP.

Student Engagement. During a period of significant transition when faculty members and city personnel changed almost completely, student coordinators continued to receive and respond to calls, drawing in other students when necessary. Students were integral to the development of the program's structures, including the relationship with the city and the online documentation and

communication system. Hence, while individual faculty members and students changed, the student workforce remained as a continuous connection, maintaining conciliation services via the LTDP, as well as sustaining ties among the institutional partners.

Sustaining and Transferring the Partnership's Identity. Beyond the activities of the program, the student coordinators also sustained and transferred to new personnel the partnership's identity. A partnership identity (Janke, 2008, 2009) is how members of the partnership view "who we are" as participants in service delivery. A shared partnership identity is established over time through a series of interactions.

A partnership identity was established with LTDP by the faculty and city staff members who first initiated the program. They did this within the first three years by articulating shared values, establishing patterns and expectations for communication among the organizational entities (norms), setting clear roles and responsibilities among the partners (organizational infrastructure), and creating the expectation that this project was not simply a one-time or short-term effort.

Hence, during a time of significant leadership change, three things occurred that contributed to the formation of the LTDP's partnership identity. First, partners understood not only the shared values for the project, but also understood each organization's values and priorities. Thus, they understood how this project aligned with key institutional priorities. Second, there were key players who continued even when some staff members changed, because the agency personnel valued the project. In addition, because of the program's links to the curriculum, there were opportunities for students to continue to receive instruction in the skills necessary for conciliation. Third, there existed practical organizational structures, such as the presence of student coordinators and the incorporation of the LTDP into the existing workflow of city staff, to guide the activities of the partnership through the significant period of transition. The partnership's identification with shared values, norms, structures, and expectations was shared by the students, faculty, and city staff who were involved at different points throughout the term of the partnership.

Other Local Colleges. As noted, the partnership expanded to include Guilford College's Conflict Resolution Resource Center, a program that provides

undergraduate students an opportunity to practice their dispute-resolution skills. This multi-campus involvement enhanced the continuity and sustainability of the program, particularly over the summer months and through the inevitable student turnover that occurs between semesters and because of vacations and graduation. For example, a student at Guilford College managed the LTDP calls when the previous student leader who was from UNCG graduated.

Joint meetings and training activities involving both students enrolled in the programs and city staff members help to maintain the program and the norms and processes established that have produced successful outcomes. Particularly in small departments, it is critical to expand the partnership to multiple institutions and stakeholders, particularly students, to sustain the project and the partnership. During the transition of personnel among partners, students were instrumental in sustaining and transmitting the identity of the partnership to the new participants.

Evaluating Success

Since it first began, the LTDP has received over 1,000 referrals. A conservative estimate (one hour per call) suggests that conciliators have contributed over $80,000 in volunteer time to the city. Merely counting up the hours of student conciliators, however, grossly understates the full scope of contributions provided to the city and its residents.

Conciliators save not only the time required to address the callers' needs, but they also help avert costly mediation or litigation, each of which requires expenditures by the landlords, tenants, and taxpayers in the form of government (city, and court) resources and time. Most calls referred to the LTDP are resolved through conciliation efforts (contact with either or both parties over the phone) or by providing information or referrals to another agency. Of course, the disputing parties resolve some conflicts independently, while others do not respond to the conciliator's attempts to contact them. In a few cases, the available phone number is incorrect or disconnected. Only a few calls ultimately are referred for mediation or to legal aid staff. City staff members' time is freed to address social-justice issues, such as conducting discrimination investigations, and attending to other administrative and enforcement activities, including education and outreach.

The achievements of the LTDP may be conveyed best by the anecdotal stories told by student volunteers, tenants, landlords, and city staff (Hayes, 2012). They speak about improving the quality of life of individuals through conflict resolution—helping to address conflicts in relationships that otherwise might continue for many months or years; clarifying issues, expectations, or needs involving a conflict; empowering the parties with information; and increasing the quality of services while reducing costs to taxpayers through alternative conflict resolution.

If institutions are to support faculty-led and department-invested partnerships to foster greater community prosperity, then it is critical to examine what the effects of the partnerships and projects are on the academic department. The experience of the PCS department with the LTDP demonstrates a tangible manifestation of the department's commitment for faculty to engage with the local community for mutual benefit. Important culture-shaping conversations about what community engagement means and why it is a signature feature of the undergraduate and graduate programs are key departmental outcomes.

While many conversations occurred among various partners during the time of transition, several key issues were addressed. The first dealt with whether the partnership was a relationship that existed between individuals or whether it was a relationship that existed between the city Human Relations Department and the UNCG Peace and Conflict Studies Department? Second, why should each party continue the program? How does it align with current priorities?

Beyond the project, broader questions about the department's reputation, relationships, and identity surfaced for the department chair and faculty. For example, how ought we to act, as a community-engaged department? If we are who we say we are, what is our obligation to the partners of our faculty? As the (current) chair of the Peace and Conflict Studies Department stated, "This [handling of the partnership] shows the character of our institution. How do we treat those community members to whom we have commitments?" Further, she spoke about modeling appropriate behavior of students, saying that the continuation of the project "demonstrates the commitment to our students about what is required as part of professional character" (C. Schmitz, personal communication, October 21, 2014).

Landlord-tenant disputes are ubiquitous; hence, the need for landlord dispute-resolution services within towns and cities throughout the world. To replicate the success and sustainability of the Greensboro LTDP, the areas presented in the MAPDIP tool should be considered. For example, does the activity address something that the community has identified as a priority? Is it an area to which the department has existing capacities and strengths? Is the work aligned with the curriculum? Is it aligned with the university's mission and vision? Is it an activity that is likely to be recognized and rewarded within the departmental and university systems? In the authors' experiences, a frequent error is to think of these initiatives as distinct projects that exist outside of these contextual factors. While this chapter describes details that can facilitate implementing a similar project, the success of a replication will depend on whether similar thorough discussions take place within the context in which the initiative will occur.

The view that community engagement is the purview of individual faculty who establish interpersonal relationships is being replaced by more collaborative efforts. This is being seen at UNCG as well as nationally. For example, students and faculty in the UNCG Bryan School of Business and Economics have collaborated with the North Carolina Department of Agriculture and Consumer Services and the North Carolina Wine and Grape Growers Council to create a strategic plan to better serve the state's 400 commercial grape growers and 125 wineries. Several faculty members have been involved in research, and students have conducted community-engaged capstone projects, which have been shown to support student learning and critical thinking (Canziani, 2014).

A new generation of faculty members is emerging that embraces more collaborative and multi-disciplinary approaches to scholarship (Trower, 2006; Holland, 2012). These faculty (primarily generations X, Y, and millennials) come into the academy to address complex problems of public importance, and they seek collaborative and holistic approaches and outcomes. The gap between the collaborative approach of the newer faculty and the "old guard," who prefer discipline-specific and individual research agendas, can be bridged by this model of department-based teaching and scholarship in partnership with community groups.

Conclusion

This chapter suggests that sustainable and effective community-university initiatives that engage faculty members should be invested in by departments, rather than by individual faculty members, and that they should be carried out in the community as opposed to with the community. Initiatives that are not aligned with the department's mission, are not consistent with the vision of the institution, and most importantly, are not responsive to priorities in the community are unlikely to be continued. And if these misaligned projects are continued, they are not likely to evolve based on a thorough review of the successes and challenges of the initiative. The mapping tool may be used to describe key features of any faculty-led initiative, as well as help others decide if an activity or relationship is worth pursuing. If a project already exists, the tool can be used to strengthen the likelihood of its sustainability.

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Intellectual Property Management for Small Research Offices

Richard Wellons and Arjun Sanga

Overview

Approaches to management of intellectual property at colleges and universities is an increasingly important issue—particularly at smaller, less research-intensive, institutions. The legal framework created by the passage of the Bayh-Dole Act, combined with the growth in related federal regulations, makes the development of a cohesive, strategy-based policy for managing intellectual property essential. Without a policy that faculty can access and understand, an institution not only runs the risk not complying with Bayh-Dole directives and thus hampering its ability to pursue federal grants, but also of limiting its potential for using university-led innovation as a tool for regional community and economic engagement. This chapter will explore how several smaller institutions have approached intellectual-property management, on their own and through their larger state systems and resources. Brief case studies of issues and solutions are presented from the University of Wisconsin System, the University of Southern Maine, Elizabethtown College, and Plymouth State University (N.H.) as a way of identifying some common needs and potentially replicable solutions for managing intellectual property.

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Plymouth State University (N.H.) and Elizabethtown College (Pa.) both faced a similar problem—a need for clear guidelines and increased engagement with faculty on issues related to managing intellectual property, combined with a lack of resources to address the problem on their own. Both institutions looked for help from a third party—in the case of Plymouth State University, an outside technology-transfer consulting firm, and in the case of Elizabethtown College, a unique negotiated relationship with a patent attorney.

Examples from the University of Southern Maine and the University of Wisconsin System also demonstrate approaches that have made creative use of connections and resources broadly available within their respective systems. The University of Southern Maine was able to take advantage of resources provided by the University of Maine Center for Law and Innovation's Intellectual Property Clinic. The University of Wisconsin System, inspired by a successful approach taken by the University of Wisconsin, Madison, created the WiSys (Wisconsin System) Technology Foundation, which supports research and commercialization for 11 four-year institutions, 13 two-year colleges, and the University of Wisconsin Extension.

Bayh-Dole Framework

The modern university is no longer just an ivory tower. Universities are important places for innovation and collaboration. They have become more connected to their communities in supporting local, regional, and national businesses through innovation and technology development. Classroom and laboratory activities generate ideas, advance knowledge, and lead to new technologies. These innovations and technologies can be transferred from the university to the private sector to form the basis of new products, services, companies, and even industries.

A key component enabling this process of "technology transfer" is securing rights to intellectual property in the form of patents, copyrights, and trademarks to name a few avenues. These intangible pieces of property can then be transferred to private entities through license agreements that allow the private entity to invest in the innovation, commercialize the technology, and get new products and services out to the public. The licensing agreement is the vehicle for getting the innovation into the hands of a commercial entity that can ultimately turn it into useful products and services for the public. The license can also return revenues to the university and its inventors and other stakeholders to continue a self-perpetuating cycle of innovation.

In 1980, the Bayh-Dole Act unleashed the potential for spurring innovation through universities by transferring ownership of rights to intellectual property developed in federally funded research projects from the federal government to

the universities receiving the federal funds. This act provided universities with the rights and incentives to commercialize intellectual property they had generated and freed them to invest in protecting intellectual property (e.g., patents) knowing that they could benefit financially if the inventions were successfully commercialized. The law created a reinvestment cycle as royalties returned to the universities were shared with inventors but also re-invested in research, leading to more innovation. As a result, not only are universities involved directly in technology-transfer activities, but programs and centers also have sprung up to support entrepreneurs and to accelerate the development of new companies.

Responsibility and Possibility

While successful management of intellectual property can play a key role in creating opportunities in and outside of a university, it is important not to overlook the fact that it is also a requirement to remain in compliance with government guidelines. The Bayh-Dole Act and its surrounding legislation requires a university to identify and disclose inventions created as a result of federal funding. Bayh-Dole allows the university ownership of the inventions (with the federal government holding rarely invoked "walk-in" rights) but, in return, the university must make an effort to protect (e.g., patent) and commercialize the invention. If a university fails to report an invention to the government, it risks being out of compliance with the terms of Bayh-Dole, potentially resulting in severe repercussions to a university's ability to continue receiving federal funding. This philosophy of information sharing and distribution encouraged under the Bayh-Dole framework has spread and expanded among many large private funders, which are increasingly requiring grantees to release products developed in funded research through permissive open licenses. It is important for universities to have a system in place to identify these inventions and copyrightable products, protect them, and find the best way to distribute them in accordance with the university's mission. However, an effective system for managing intellectual property requires specialized expertise, financial support for the process of protecting the intellectual property, and policies that are clear and can be understood by university faculty members and administrators.

Public colleges and universities have traditionally embraced a threefold mission—education, research, and service. These goals are approached and emphasized in varying ways depending on the values of the institutional leadership and available resources. Mark Crowell, former president of the Association of University Technology Mangers (AUTM), notes that many universities have been expanding their traditional mission by embracing economic development as a fourth goal. When looking at the role of state colleges and universities as "stewards of place," economic development can be seen as a natural complement to the traditional core pursuits of a university.

With the elevation of economic development in the university mission, the role (and expectations) for intellectual property have increased dramatically. The transfer of a university's intellectual property through licensing of technology and through sharing innovations developed in research is an important tool in efforts to engage in economic development. But what's the best approach? Crowell notes that most strategies for technology transfer and intellectual property are reactive, responding to an outside driver. Ideally, though, just as an overall institutional strategy must be developed to pursue the university's mission, an institution should actively develop a cohesive strategy for its intellectual property, one that reflects and complements the overall institutional mission. Whether an intellectual-property policy is developed prospectively or in reaction to a need, a system for managing intellectual property provides checks for compliance with government regulations and can allow intellectual property to be used as an effective tool in a university's mission, helping it address not just economic development in the surrounding community but also education, research, and service.

Economic Impact and Benefits

Intellectual property produced by colleges and universities historically has had a profound economic impact on the U.S. as a whole and potentially can have a similar impact on a university's surrounding region and community. The 2013 AUTM annual licensing survey of approximately 200 academic institutions reports that close to10,000 patented products currently being sold originated in academic research laboratories.

University-licensed technologies make a significant contribution to the national economy, accounting for $22.8 billion in net product sales. Of the 818 start-up companies formed through the work of the survey's respondents in FY 2013, 611 of them had their primary place of business in the licensing institution's home state. And these start-ups have been increasingly successful. More than 4,206 start-ups based on university technology were still in operation as of the end of that fiscal year, a 5.1 percent increase from the previous year. According to an April 2010 Science Coalition report, "Sparking Economic Growth," companies spun out of university research tend to locate in the university's home state and have a greater success rate than other companies, creating good jobs and spurring economic activity. Of the 100 companies highlighted in the report, only 16 originally located in a state other than that of the university that developed the innovation.

However, technology transfer is not an instant way to make money for the institution. According to researchers, over half of university technology transfer programs bring in less money than the costs of operating the programs, and only 16 percent are self-sustaining after distributions to inventors and costs are factored in. Most universities do not make much money from their licensed intellectual property, especially not in the short term. But a clear, understandable policy combined with continued faculty engagement efforts can save an institution money by keeping it in compliance with federal requirements and helping avoid disagreements and potential lawsuits over contracts with conflicting or untenable obligations (often signed without the knowledge or understanding of university administration). A good intellectual property policy with faculty buy-in can result in deals done with the administration's knowledge and agreements that are advantageous to all parties, while supporting the university's mission. A good policy can also create an attractive environment that encourages businesses to contact colleges and universities with their own initiatives, and it can serve as an enticement to attract and retain entrepreneurial and innovative faculty members. Successfully managed intellectual property can lead to the creation of local businesses with an affinity for the university and surrounding community. It can lead to partnerships with industry that provide research or business experiences for students. Effective approaches to the transfer and management of intellectual property can be used as the foundation for programs that encourage students to apply their research, as well as to patent and commercialize their own inventions.

Approaches to Managing Intellectual Property

An institution's strategy for managing intellectual property will depend on its goals for intellectual property, as well as on its unique set of available resources. Some institutions have a long history of guiding technology transfer, while others have only recently adopted or revised policies in a more strategic way. To be successful, intellectual-property management requires expertise in contract law, government and state regulations, marketing, and business negotiations—not to mention an understanding of the invention itself, including its possible uses and financial potential. For many universities it is difficult to find all of these abilities in two or three people and, even then, to find the resources to compensate them directly.

Elizabethtown College and Plymouth State University are both teaching-oriented institutions without a history of focused attention on intellectual property. Both were in need of a clear, uncomplicated policy that would protect faculty members while giving them the incentive and confidence to identify and pursue commercially viable inventions. Unfortunately, neither had the resources to hire the staff who could handle the responsibilities of a full-time technology-transfer office. Both came up with solutions that, in the long run, enabled them to save money, remain in federal compliance, and encourage faculty members to share the products of their research with the surrounding communities.

Elizabethtown College. From its inception in 1899, Elizabethtown College was primarily a teaching institution at which faculty members conducted research when they could manage it in their spare time. Accordingly, intellectual property was not being managed in a systematic way that clearly outlined the responsibilities and outcomes for each stakeholder. Faculty had a relatively free rein with their research and resulting inventions. There was a danger that an absence of oversight and institutional guidance would lead to non-compliance with grant requirements. It was apparent that Elizabethtown College needed a cohesive policy for managing intellectual property in place to remain competitive for research grants and, importantly, to insure compliance with any grant agreements. To solve the problem and satisfy the university's lawyers, an intellectual property policy was codified in a long and complex document.

This first attempt at formulating a policy was based on policies used by larger, more research-intensive programs. Unfortunately, though well-meaning, this policy risked alienating faculty members who were used to a much more informal and personal relationship with their administration. Recognizing the need to have a more user-friendly policy, the college sought help from an outside patent attorney in revising the policy and making it better fit the culture of the institution. Elizabethtown College then started a process to revise the policy by holding meetings with its personnel council, ensuring faculty feedback. The administration reviewed the revised policy and then presented it to the entire faculty assembly.

With the help of the patent attorney serving as a consultant, and with input from the faculty through the personnel council, the college managed to take a complicated, lengthy, and confusing document and reshape it into an accessible policy of less than a page in the faculty handbook. Under the new policy, the faculty inventors assigned control of their inventions to the college but received a 50/50 split of any eventual revenue after expenses. Similar to intellectual property policies at most educational institutions, traditional works of scholarship are owned by the creator(s) and are an exception to the policy. The new policy clarified ownership of inventions and provided support for securing intellectual property. Though faculty members originally had more of a free hand with their inventions, they now see development of intellectual property as a mutually beneficial partnership with the college because they are free to continue focusing on teaching and research while the financial, marketing, and regulatory burdens are assumed by the university.

The revision of the first policy began in 2011 and concluded in less than two years. Because Elizabethtown College does not have the resources to run its own technology transfer office, it works with a private patent law firm using a specially negotiated relationship avoiding hourly rates and using set fees for services. The negotiated price list includes set fees for services such as invention reviews, provisional patents, full patent applications, and so forth. The college's sponsored programs office evaluates which inventions are sent to the firm for review and decides how to proceed based on the resulting recommendations. Knowing what they know now, college staff members would have found it more effective to directly engage with faculty members earlier in the process of developing the

policy on intellectual property. Having learned more about policy development from the revision process, Elizabethtown College is developing a policy for dealing with research misconduct that includes greater faculty engagement, allowing faculty members to help shape the policy as it develops, instead of getting feedback after the fact.

Plymouth State University (PSU). Located in central New Hampshire, PSU successfully solved the problem of providing intellectual property management and technology transfer services to a campus with limited resources. Prior to this initiative, PSU had not adopted a policy on intellectual property that was agreeable to the entire university community. With a strong commitment to regional engagement, PSU's administration sought to devise an intellectual property policy and system for supporting technology transfer that would provide incentives for faculty members to develop their innovations and focus them on public benefits. Within the context of their strong system of shared governance, the faculty had a lot of questions and concerns about intellectual property that made them cautious about endorsing a policy. PSU's vice provost for research and engagement said that the situation the faculty faced was analogous to signing boilerplate contracts to buy their first houses: They were faced with a stack of documents that had to be signed, but realized it was impractical to read them all first. The uncertainty about the future implications of the policy was intimidating to faculty members, and they wanted to be sure their interests would be served and not be subject to unintended consequences.

The faculty presented an alternative intellectual property policy to the administration, which felt it was not workable for the administration or for federal compliance, resulting in an impasse and ambiguity about how best to pursue commercialization of faculty innovations. As a result, the university was not able to do all it could to promote an ecosystem of innovation. As with Elizabethtown, Plymouth State was also concerned that the lack of a coherent intellectual property policy and management system would limit its capacity to sustain compliance with federal requirements and competitiveness when applying for federal funds. Plymouth State wanted to expand its capacity for technology transfer, encourage innovation on campus, and use intellectual property as a way to connect with the broader community and local businesses. Officials needed a policy and a

management system capable of engaging in this outreach, but found it was too costly to hire a technology transfer officer and set up a small office.

Coincidentally, Keene State College, a sister institution in the University System of New Hampshire, was also looking to revise its policy on intellectual property and build its capacity for managing intellectual assets. It too could not afford to create its own technology transfer office. As a result the two universities decided that a cost-effective way to solve the problem would be to work together to hire a third party to support a cohesive policy on their respective campuses and handle most of their management needs. The two institutions issued a joint request for proposals (RFP) for a technology transfer practitioner to help develop policy and establish procedures for disclosing technologies, filing for protection of intellectual property, licensing technologies, enforcing agreements, and bringing products to market.

The two institutions received 15 proposals. One-third came from each of the following types of organizations or individuals: large technology transfer firms, law firms, and solo practitioners/consultants. It was initially thought that a solo practitioner might be best for their needs as this would allow them to develop a relationship with a local individual who would understand them and their unique circumstances. However, upon reviewing the proposals, none of the solo practitioners or consultants demonstrated that he or she could effectively meet all of PSU's needs.

In addition, the law firms' proposals were too focused on filing for patents and were too quick to apply legal solutions to most of the institutions' needs, ignoring the RFP's request for consideration of interdisciplinary solutions. In addition, staff members at the institutions were most impressed with the applications from the larger technology transfer firms, finding them superior to the other RFP respondents.

Ultimately, Plymouth State and Keene State partnered in signing an agreement with a technology transfer firm that met all of their management needs for less money than it would cost to hire their own staff or build an office. The agreement called for the firm to support the administrations and faculties as they developed

suitable policies for managing their intellectual property. It also employed the firm to give presentations on intellectual property to faculty and administrators on campus and over the web, connect the two institutions with other campuses, handle commercialization, assess inventions, and help find corporate partnerships. As the campuses developed the policies, the firm held a series of workshops with faculty members, conducted surveys, and shared templates of workable policies. The transparent and intensive engagement with faculty and administration during the review process led to a nearly unanimous vote to approve the fully developed policy. Plymouth State University now splits revenue from licensed inventions with its faculty and, as with Elizabethtown College, a clear intellectual property policy has led to an increase in faculty confidence and in invention disclosures.

For the first time, the university is receiving a small amount of revenue from licensing. The new arrangement also gives the institution access to more services across more disciplines than it would be able to provide on its own. The combination of an increase in capability, a clear policy, and an increasingly involved and informed faculty is now a viable starting point from which Plymouth State hopes to achieve its broader goal of cultivating a more innovative campus culture that can engage with the economic-development needs of the surrounding community. The ongoing cost-effective support from the firm has proven to be a flexible and effective alternative to building an in-house technology transfer office.

University of Southern Maine (USM). This institution tried a unique approach to technology transfer by engaging the law clinic at the University of Maine's School of Law in Portland. The law school hosted an intellectual property clinic and the Maine Patent Program within its Center for Law and Innovation, which helped institutions within the University of Maine System until both entities in the law school were discontinued due to reduced enrollment and state budget cuts. USM had a relatively small amount of technology transfer compared with its flagship campus, but it was able to take advantage of the clinic prior to its demise.

The University of Maine School of Law was one of only a handful of law schools emphasizing patent and trademark law, where students could get practical experience working on actual intellectual property matters. The student law clinic was an innovative solution for campuses within the Maine system that did not have

the volume of work or resources to justify their own technology transfer offices. Additionally, the clinic served the needs of the greater community.

The clinic started out as an offshoot of the University of Maine Patent Program and, in the beginning, was sponsored by the state. Student externs saw clients, which included universities within the system and other campuses in Maine, in return for college credit. The clinic allowed students to file and prosecute patents under the supervision of a patent attorney, giving them valuable real-world patent experience as they completed their academic work. Aside from helping the law school educate students, the clinic contributed to the broader university goals of service and regional economic development and engagement. The clinic handled most aspects of technology transfer for the USM: receiving invention disclosures, evaluating the commercial prospects of the invention, reviewing the disclosure with university administrators, filing for intellectual property protection (e.g., patents), and licensing the technology. The clinic worked on an informal contract basis with university campuses and provided clients with free representation with the goal of promoting local commercialization. The law school provided most of the salary support, which was supplemented by university departments using the clinic's services.

As a free resource, the clinic faced some challenges. First, its popularity was a double-edged sword as it was difficult to provide adequate service to a long line of customers. Accordingly, the clinic had to delineate what it would provide. All clients would, at a minimum, get feedback about their invention in the form of a patent search and analysis. The clinic would then triage the caseload based on circumstances to determine which cases merited filing for protection of the intellectual property. A second challenge came from the flexibility required when engaging students. Clinic staff had to be committed to completing a project when service gaps occurred because of the transient nature of students. Finally, because the work was generally under-resourced as well as education-focused and service-oriented, generating measurements of its success or impact was not a priority. It's possible that a robust record of success stories, combined with long-term data on its regional impact, might have helped the program when its funding was eventually threatened. Unfortunately, though the program was very useful to the surrounding community and to the university system as a whole, the program

was ended, as noted above, as a result of reduced enrollments and state budget reductions.

University of Wisconsin System. The Wisconsin system's example, while larger and somewhat more complicated than the situation in Maine, also focuses system resources in a way that benefits larger and smaller campuses, giving them capability beyond what they could cost-effectively do on their own. The University of Wisconsin System needed to provide services for managing intellectual property to faculty members at comprehensive institutions to help them advance their research and commercialize their inventions. The UW System also wanted to help the comprehensive institutions transition from exclusively teaching institutions to partners with their communities by supporting research that could lead to collaborations with local industry. The solution was to expand an approach that was already successful at one institution so that it would serve the broader state higher-education system.

In Wisconsin, the process of university-based technology transfer dates back to biochemist Harry Steenbock's discovery in the 1920s of a technique to increase the vitamin D content in food and other substances, a discovery with the potential to eliminate rickets. Steenbock worked with several colleagues to create the Wisconsin Alumni Research Foundation or "WARF" as a not-for-profit foundation to patent and commercialize his invention and use any proceeds to support research and discovery at the University of Wisconsin-Madison.

In the 1990s, professors from comprehensive universities (other than UW-Madison) in the UW System occasionally came forward with inventions, unsuccessfully seeking assistance for commercialization. While WARF had been a huge success for UW-Madison inventors, the foundation's charter directed support only to the Madison campus. In 2000, the Wisconsin System Technology Foundation (WiSys) was founded with the support of WARF and the system's administration to assist campuses other than UW-Madison. As noted above, WiSys now supports research and commercialization for 11 four-year comprehensive institutions, 13 two-year colleges, and the University of Wisconsin Extension, the outreach arm of the UW system. Although founded as a subsidiary of WARF, WiSys is now an independent 501(c)(3) supporting organization of the University of Wisconsin System.

At its core, WiSys protects intellectual property through patents, copyrights, and trademarks and seeks to license that intellectual property to new or established companies. WiSys has the internal expertise to evaluate invention disclosures, and if WiSys determines that an invention has merit, it has the resources to protect the intellectual property (through patents, copyrights, or trademarks) and to invest in the development of that intellectual property (through grant programs) to advance the technology and attract investment and licensing. WiSys also supports applied research by administering a grant program on behalf of the UW System.

WiSys supports economic development in Wisconsin by partnering with small companies through its Wisconsin Small Company Advancement Program, working through UW faculty and staff members and students. Through funds provided by the state, WiSys provides grants to small companies incorporated in Wisconsin that are willing to partner with UW personnel or students to develop technologies with commercial potential. Finally, WiSys is engaging students to enhance their experience through undergraduate research, internships, and the WiSys Student Ambassador program. As a relatively new foundation, WiSys gets annual operational support from the University of Wisconsin institutions it serves, as well as from the system.

Because WiSys is asked to play a broad role on behalf of a number of institutions within the university system, the structure of WiSys is necessarily more complicated than that of a college or university working on its own. WiSys has a self-perpetuating governing board of trustees, which includes leadership from the UW System, WARF, and external members representing regional constituents. WiSys also has an advisory committee that includes chancellors from the UW System, a regent, system administrators, and external members. While the structure is larger and more complicated than the approaches previously examined in this chapter, there is a clear organization and a leadership make-up designed to ensure the entire system is served and that the broader regional mission of the university system is addressed. WiSys is an example of pooling resources to take advantage of economies of scale to deliver technology-transfer services.

Overcoming Common Challenges

Colleges and universities face a number of internal challenges when shaping and implementing policies for managing intellectual property: maintaining compliance with governmental dictates; educating and motivating faculty and administrators; creating and maintaining an ecosystem of innovation; managing the expectations of internal and external stakeholders; and balancing the need to protect intellectual property while taking full advantage of its potential to engage and support the surrounding community.

Any approach to managing intellectual property requires a clear policy as well as the buy-in and understanding of its key stakeholders—university researchers and administrators and community and business partners. Faculty and administrative advisory councils should be consulted and involved in the creation or revision of the policy, as well as its dissemination and implementation. A common management problem with intellectual property is that faculty members and administrators are not aware of the policy or of exactly who to talk to about an invention. They also may not be aware of an invention's potential uses or prospects for commercialization. Without clear guidance and engagement or with a policy that is too complicated to understand, faculty members can remain unaware of their rights and responsibilities and take it upon themselves to enter into agreements without proper authority or sign off. They may enter into agreements that are disadvantageous, causing financial and legal headaches to the institution, the faculty member, and outside businesses. These types of negative outcomes can hamper future efforts at collaboration with local business and industry and can discourage entrepreneurial researchers from going to an institution. Another danger is that research with the potential for creating opportunities for business, the community, and students goes unrecognized because disclosure is too complicated or ignored.

Elizabethtown College and Plymouth State University were both teaching-focused schools looking to expand research capabilities and utilize the resulting inventions to further their missions. But a simple, coherent policy was required before any expansion of intellectual property efforts could be contemplated. Clear policies combined with faculty outreach and engagement led to an increase in trust and

comfort among faculty members regarding intellectual property and disclosure of inventions. A partnership between the faculty and administration needed to be created and, for it to be effective, the terms needed to be understandable, mutually beneficial, and agreed upon.

Involving faculty and administrative representatives in the process from the ground up invests them in the outcome. The rules are known, mutually beneficial, and easy to understand because representatives of the faculty and administration were heavily involved in making them and ensuring that their interests were served. Throughout the process, as well as during and following its implementation, stakeholder education is necessary—not only regarding regulations and available types of licensing and commercialization, but also regarding how to recognize opportunities for using intellectual property to engage with the surrounding community and advance the university's regional mission.

In addition to a clear understanding of the rules, faculty members and administrators need incentives and resources to engage in the process and develop their intellectual property. In most of the examples presented above, revenue is shared equally, after expenses, between the faculty member and the institution. The institution maintains ownership of the invention, but relieves the faculty member of many of the administrative and regulatory burdens of disclosing an invention to the government and applying for patents. Revenue sharing and easing the administrative burden and responsibilities provide some incentive for faculty members to take part in the intellectual property system. Additional incentives include course release (which also gives the faculty member a key resource—time), funding for departments, and recognition and awards at events honoring faculty researchers.

WiSys addresses course release with a program in which a faculty member could apply for funds to buy out teaching a course in order to write a grant. This type of program helps alleviate the issue that many faculty members face of not having time to apply for grants that would allow them a course release and time to conduct research and apply for more funding. The program favored proposals in STEM (science, technology, engineering, and mathematics) fields but also had a humanities component. To be eligible, the faculty member needed to be applying

for a grant of $50,000 or more. If accepted, the UW System, the institution, and WiSys shared the cost of the buyout. Awards recognizing inventors have also played a key role as incentives for WiSys.

Advice for University/College Leadership

In summary, university administrators of comprehensive universities should consider important lessons learned from these innovative programs as they consider setting up their own programs. They include:

- Faculty, administration, and external stakeholders should be included in the development of policies to ensure that they are clear, understandable, and beneficial to all parties.
- Any policy should include a reasonable and transparent basis for sharing revenues that might accrue from licensing.
- Research support and compliance should be promoted as key reasons for developing intellectual property policy and procedures.
- Institutions should avoid raising expectations of short-term revenue as a benefit from licensing and patent activity.
- Colleges should reward and acknowledge persons who participate in research, innovation transfer, and entrepreneurship activities.
- A college or university should develop a strategy for managing its intellectual property that fits the strategic plan of the institution.
- A strategy for managing intellectual property should include the development of an innovation and entrepreneurial ecosystem that benefits the institution and the surrounding region.

- During and after the development of a policy, institutions should work to educate the campus community and the regional business community about the value of the intellectual property policy and requirements.

- Colleges and universities should be aware of and use opportunities provided by their innovation activity to benefit curriculum development and applied student learning.

Measuring Success

How do we evaluate the success or failure of the management of an institution's intellectual property once a clear and understandable system has been implemented? As former AUTM President Mark Crowell writes, "…it is especially important to align the metrics used to evaluate technology transfer effectiveness in a way that reflects the objectives and values enunciated for the function." Revenue generated by licensing, while worth pursuing, is not the ultimate goal for institutions that see themselves as "stewards of place," and the metrics used to evaluate success need to reflect this.

Colleges and universities may not experience immediate benefit from the licensing of inventions. That's not to say that fair market value for university-created research shouldn't be pursued and protected. But the more important measurements of success are the connections that carefully managed intellectual property (and its transfer) can make between the college or university and its region—(1) the creation of new companies and the resulting jobs; (2) mutually beneficial agreements with industry and businesses that create opportunities for student research and growth; (3) the enabling of programs that encourage and engage students to create, apply, and commercialize ideas; (4) the development of innovations in public health or service that benefit the community; (5) participation in an ecosystem of innovation that uses management of intellectual property to encourage creation within and outside the institution. Each of these outcomes is quantifiable and can be used to measure an institution's positive impact on its surrounding community and region. A less quantifiable measure of success, but no less important, is the collection of outcomes for individuals—the

human stories behind the numbers—of students and community members affected and empowered by the creation and application of research-and-development projects.

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Promoting Entrepreneurial Activity on Campus and in the Region

Brian Tapp and Foster Roberts

Overview

The promotion of entrepreneurial activity both within the university and throughout the region served by the institution has become an essential component of effective outreach efforts from the campus. This chapter examines academic programs that foster entrepreneurship and student-focused programs offered through the university's Douglas Green Center for Innovation and Entrepreneurship. The chapter highlights the pathways to success in both program areas and reviews how the university has overcome challenges in developing entrepreneurial programs.

The authors examine outreach-focused programs that foster entrepreneurship in the region. The university's Missouri Innovation Corporation (MIC), a nonprofit 501(c)(3) organization, oversees a revolving loan fund and consulting services to potential entrepreneurs and owners of small businesses.. The pathways to success, the challenges faced in implementation of entrepreneurial programs, and strategies for assessing the effectiveness of entrepreneurial activity also are reviewed.

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Today's competitive environment is characterized by a dependence on creativity and innovation facilitated by entrepreneurial activity, not only in the development of new start-ups but also for facilitating sustainability among established companies. Entrepreneurial activity can be defined as effort directed toward the discovery or creation of opportunities aimed at solving well-defined problems or fulfilling needs in the marketplace.

The importance of entrepreneurial activity cannot be understated—it is one of the main contributors to economic growth, job creation, community development, and competitive innovation (Decker, Haltiwanger, Dillard, Jarmin, and Miranda, 2014), within regions and across the globe. Empirical evidence shows the diverse impact of entrepreneurial activity. In countries with higher per capita incomes, entrepreneurial activity positively influences gross domestic product (GDP), while

in countries with lower per capita incomes, entrepreneurial activity has been found to negatively influence economic growth with respect to GDP (van Stel, Carree, and Thurik, 2005). However, these authors suggest that entrepreneurial activity in poorer areas still carries great importance for economic development. The economic benefit of entrepreneurial activity in developing economies may rely upon the establishment of larger firms, investments in human capital (van Stel, Caree, and Thurik, 2005), and development of infrastructure that will allow entrepreneurs to better market and deliver their innovations to a broader global customer base (Ekmekcioglu, 2013).

Universities play an instrumental role not only in promoting entrepreneurial activity but also in developing human capital necessary to realize the potential positive impact of such activity on economic factors. The relationship between entrepreneurial activity and university efforts to promote such activity is characterized by the dynamic interplay of multiple stakeholders. Etzkowitz (2014) suggests that entrepreneurial activity is fueled by the interactions of universities, industries, and governments. While universities spur entrepreneurial activities through incubation, industries promote such activity through training and professional development. At the same time, governments create the regulatory environment within which universities and industries operate and also provide programs to aid universities and industries and nascent entrepreneurship directly. In the U.S., such governmental programs include Small Business Innovation Research (SBIR), which serves as a research and funding agency to promote entrepreneurship.

Etzkowitz (2014) also suggests that throughout the Americas, Asia, Africa, and Europe a shift is occurring in how these three stakeholders (government, education, and industry) function. Traditionally, each stakeholder operated independently, but more recently they have assumed interdependent roles. "The government's primary role is regulator, universities' role is firm creation and regional economic development as well as providing individuals with knowledge capital which they can take into the market to fulfill roles, and industry's role is training and research within their respective areas" (Etzkowitz, 2014, p, 329).

Additionally, the role the university plays in promoting entrepreneurial activity now is being recognized as more essential because, Etzkowitz says, "it has the students and therefore, it has a flow-through of people coming and leaving, graduating,

going into society, and new people coming in" (p. 328). Therefore, universities may better fulfill their role in promoting entrepreneurial activity through the integration of programs aimed at developing regional entrepreneurship externally and internally educating students across disciplines to develop an entrepreneurial mindset.

Fostering entrepreneurial activity among students begins with a strong, supportive administration committed to the development of academic programs and curricula emphasizing entrepreneurship across schools and colleges within the university. The development of the internal environment of the university will be addressed first, followed by a review of approaches to an externally oriented outreach effort.

Academic Programs Promoting Entrepreneurship at Southeast Missouri State

Southeast Missouri State University offers several minors promoting entrepreneurship in disciplines as diverse as agriculture/horticulture, biological and medical sciences, fine arts, health management, and industrial and engineering technology. These programs are designed to educate students on the entrepreneurial process by working with faculty members who not only possess expertise in their disciplines but also have practical experience developing entrepreneurial opportunities in their respective fields. In addition, these academic programs provide students the opportunity to engage in the entrepreneurial process through experiential learning. Finally, such programs nurture a competitive environment for students through the development of awards and other types of recognition of students' ability to recognize opportunities by means of problem identification and the development of marketable solutions.

Southeast Missouri State's commitment to promoting entrepreneurial activity across campus begins with the faculty available to assist students. Specifically, the institution emphasizes the attraction and selection of faculty members who have successfully leveraged their expertise in developing entrepreneurial ventures, particularly in areas characterized by high levels of creativity. Having such faculty in place exposes students not only to the theory and frameworks of their respective disciplines, but also to the application of that knowledge to entrepreneurial endeavors.

For example, Chris Wubbena is a professor of art at Southeast Missouri State and a professional sculptor who has successfully marketed his artistic ability and profited from the sale of his work. Such professors are able to provide students specific knowledge regarding the processes used to identify opportunities to leverage their skills entrepreneurially through practical experience. A primary objective of exposing students to these faculty members is to provide students with the knowledge about how to engage in entrepreneurial activity, as well as to instill confidence about their preparation for entrepreneurial action. Emphasis must be placed on developing programs designed to allow students to experience entrepreneurial processes inside and outside of the classroom.

Student-Focused Programs Promoting Entrepreneurial Activity

Southeast Missouri State and its Douglas C. Greene Center for Innovation and Entrepreneurship, the university's student-focused entrepreneurship unit, have several clubs and programs designed to expose students to entrepreneurship outside of the classroom. Redhawks Collegiate Entrepreneurs is a club made up of students aspiring to develop entrepreneurial ventures. The goal of the Redhawks club is to allow interaction among potential future entrepreneurs and to promote the creation of ideas, development, and testing. A further objective of this club is to stimulate students' thinking about the planning involved in developing a new venture.

Another program developed by the Douglas C. Green Center is "Coffee with Entrepreneurs." This program brings students together with practicing regional entrepreneurs to discuss ideas, creativity, and innovation. In addition, this program is aimed at providing students exposure to the real-world experiences of entrepreneurs.

Southeast Missouri also offers a program designed to expose students to entrepreneurship outside of the United States, through its annual Costa Rica Entrepreneurship expedition. The goal of this program is to expand students' mindsets from focusing narrowly on entrepreneurial activity within the U.S. to developing a more global view of entrepreneurship. During this trip, students have opportunities to volunteer on local projects and interact with the Alliance of Organic Coffee Farmers. This experience is extremely valuable as entrepreneurs

serve as catalysts to community development and experience higher returns as the community around them improves.

Southeast Missouri State adheres to the belief that the promotion of innovation and entrepreneurial activity requires being innovative in your approach to students' education. This is evidenced by the Douglas C. Greens Center's latest initiative, the Creative Labs and Industries Incubator. The incubator includes retail space, an art gallery/event venue, art and design studios, and a learning laboratory in the form of open office space. The incubator has several goals for promoting entrepreneurship among students. A primary goal is to create an environment in which interdisciplinary opportunities can be identified. Another goal of this program is to bring creative students and community members together in a laboratory setting to develop product and service innovations aimed at solving customer problems and filling customer needs. An additional objective is to provide experiential entrepreneurial education for students. The incubator operates in a retail location, where students along with consultants work on the many aspects of creating a new venture, such as designing products and services, marketing and media development, and financial management and accounting.

The university also promotes entrepreneurial activity across campus through competitive entrepreneurship programs, including the Big Idea Competition. This competition, sponsored by the Douglas C. Greene Center, is a campus-wide event in which students from across the campus submit ideas for new ventures. Two finalists are selected from each college to submit their "elevator pitch" to judges from across the U.S. who evaluate their ideas via the Internet. Cash prizes are awarded for the Grand Prize (highest overall score), the People's Choice winner (based on the on-site audience's favorite big idea), and the First Prize winners (highest score from each college). Another competition promoting creativity among students is the Greene Center's Fault Line Film Festival. In this competition, student filmmakers compete for $4,000 in prizes, as well as the opportunity to showcase their creative works.

Pathways to Success in Student-Centered Entrepreneurship Programs

Several factors contribute to the success of student-centered entrepreneurship programs such as those mentioned in the previous section. First, a supportive

university administration committed to the development of programs promoting entrepreneurial activity is required. Through such a commitment, a culture is nurtured that embraces the importance of creativity and innovation across schools and colleges of the university. Support from university administration is a factor that contributes to faculty involvement in getting students engaged in the university's various entrepreneurship programs.

Another factor contributing to faculty support of these programs is that faculty members with practical entrepreneurial experience typically value the potential of developing an entrepreneurial mindset among students, and therefore, are likely to encourage students to utilize the entrepreneurship programs and resources offered by the university. Another factor that contributes to the success of student-centered entrepreneurship programs is the students' involvement in the administration of the programs. For example, the Redhawks Collegiate Entrepreneurs Club described above is a student-run organization.

The success of the Redhawks Collegiate Entrepreneurs Club and the Coffee with Entrepreneurs program depends heavily on a healthy relationship between the university and entrepreneurs in the community. Since one of the primary goals of both programs is to connect students to practicing entrepreneurs, the willingness of those entrepreneurs to commit time and effort to students is necessary for program success. Such commitments from entrepreneurs provide students exposure to the trials and tribulations experienced by those entrepreneurs. A relationship with these entrepreneurs affords students the opportunity to share their ideas with practitioners and receive advice on approaches to evaluating those ideas. Finally, these entrepreneurs will be instrumental in the execution of the Creative Labs and Industries Incubator through mentoring students engaging in experiential entrepreneurial activity.

Challenges for Developing Student-Centered Programs

Developing student-centered entrepreneurship programs does not come without challenges. One such challenge exists in getting faculty to commit time and effort to supporting these initiatives. Universities have tenure requirements that faculty members must meet to maintain employment, so faculty devote a majority of their time to teaching, research, and service to the university. In many instances,

these requirements leave little time for involvement in entrepreneurship programs. This challenge is best addressed by offering service credits to faculty members who become involved in such programs. Also for faculty serving key positions in coordinating such programs, course release can be offered to allow sufficient time for the administration of the programs.

As with most university initiatives, a challenge exists in securing capital to fund entrepreneurship programs. Overcoming this challenge requires commitment from the university administration to provide such resources. Strong relationships with alumni and contributors to the university also can make resources available. The generosity of donors can make the difference in the evolution of entrepreneurship from the conceptual to the concrete stage.

Outreach-Focused Programs Promoting Entrepreneurial Activity

Southeast Missouri State's Missouri Innovation Corporation (MIC) is a nonprofit, 501 (c)(3) organization focused on outreach and promotion of entrepreneurial activity throughout Missouri. The mission of the MIC is "to foster business and community development and facilitate the process of innovation to enhance the regional economy and support technology transfer and commercialization of innovations derived from research within the University, to create new high-value jobs and positive economic or social benefits for the University and regional economy." To advance this mission, the MIC promotes entrepreneurial activity in the region through helping entrepreneurs and small business owners find financing for developing their businesses and innovating to increase businesses' sustainability. The Missouri Innovation Corporation manages revolving loan fund programs designed to help entrepreneurs secure financing. The main objectives of the loan programs are to supplement financing from other lenders to create and retain jobs within the region. Also in support of this mission, the Missouri Innovation Corporation manages the Institute for Regional Innovation and Entrepreneurship.

The goal of this institute is "to support the University's strategic priority to advance Southeast Missouri's economic appeal and strength by leading in the development of an increasingly entrepreneurial economy that inspires and encourages individuals to adopt a culture of creativity, innovation, and entrepreneurship." In

an effort to realize this vision, the institute focuses on assessing the entrepreneurial ecosystems of regions throughout Missouri and works with planners to devise strategies to promote entrepreneurship.

One way that the institute promotes entrepreneurial activity externally is through providing potential entrepreneurs access to mentoring and information. Different mechanisms are employed to accomplish this task. First, the institute houses the Small Business and Technology Development Center. This center provides consulting services to potential entrepreneurs and owners of existing small businesses in a variety of areas, including assessment of feasibility, preparation of business plans, inventory control, marketing, financing, preparing loan proposals, and obtaining government contracts. The center also provides entrepreneurs guidance regarding the regulatory environment and proper accounting procedures. The one-on-one consulting is designed to provide training in areas where the potential entrepreneur may have little experience.

The institute also participates in Operation Jump Start, which is another mechanism designed to provide mentoring to educate potential entrepreneurs as to the feasibility of their business model. Designed by the Kauffman Foundation, this program provides web-based resources and, through partnerships, offers direct guidance to nascent entrepreneurs in thoroughly investigating their business ideas. While these programs are designed to provide information and coaching to those entrepreneurs who seek such support, the institute also promotes entrepreneurial activity by providing regions throughout Missouri with assessments of their entrepreneurial positions. These assessments are designed to educate planners within regions about their entrepreneurial ecosystems. These assessments are performed through the combined efforts of outreach staff and faculty members at the university who travel to different regions throughout Missouri to analyze the entrepreneurial environment. The objectives are to help work with regional planners to develop a pipeline of entrepreneurs, cultivate technology exchange and innovation, improve access to capital, promote regional marketing opportunities, and optimize the regulatory environment.

A useful example of another institution that has seen success with an outreach-focused program is the University of Northern Iowa (UNI). UNI received an Economic Development Administration University Center Grant to support regional

economic development and entrepreneurship strategies in distressed regions of Iowa. This effort directs the university's resources into regions with an emphasis on building a supportive culture, providing business and technical assistance, developing capital resources, and networking. Additionally, these efforts also provide the forum for EntreBASH, which is an ecosystem-development tool that promotes entrepreneurial development through targeted activities. These UNI activities were launched in 2014 and will continue through the five-year grant cycle. UNI also has developed a Student Business Incubator with technical assistance from a wide range of faculty, staff, and students to promote the creation and sustainability of these ventures.

Pathways to Success of Outreach Entrepreneurship Programs

The university's effort to promote entrepreneurial activity through regional outreach begins with having staff members in place who are experienced in developing relationships with the other stakeholders involved in entrepreneurial development. People are needed who are experienced in communicating with professionals across industries. More importantly, experienced personnel who have developed relationships with government entities, such as the Department of Commerce's Economic Development Administration (EDA), and who are familiar with the processes involved in acquiring grants and other support, must staff the outreach operation. These individuals also must be knowledgeable about the rules and regulations the federal government has in place, as those are the primary mechanisms through which the government facilitates entrepreneurial activity.

Another aspect of universities promoting entrepreneurship externally is helping nascent entrepreneurs gain resources to support their ventures. The two primary resources outreach can provide is education through mentoring and direction, and funding support. Southeast Missouri State has created separate, interdependent units to promote entrepreneurship in the community and region.

Providing regional planners with a clear understanding of their entrepreneurial ecosystems, the Institute for Regional Innovation and Entrepreneurship uses National Establishment Time-Series (NETS) data to give community and regional officials an overview of the economic change that has occurred within their region. This data provides planners with information pertaining to formation

of new ventures and failures within their regions and can serve as indicators of entrepreneurial trends.

The institute also employs industry cluster analysis, which is useful in identifying groups of industries within regions who share customers, suppliers, or employee skills. The information provided by these cluster analyses allows the institute's staff to help regions better understand potential unrealized economic synergies that may exist. Finally, the institute provides regions with their "innovation index," which is an assessment designed to evaluate the entrepreneurial environment and is made up of four factors: human capital, economic dynamics, productivity and employment, and economic well-being. In sum, the institute's regional entrepreneurial assessment is designed to provide guidance on how regions can best use their resources to encourage entrepreneurship. For example, where economic well-being is poor, further investigation may be needed regarding the strength of the regional infrastructure.

Challenges for Developing Outreach Programs

One of the main challenges that Southeast Missouri State faced when developing entrepreneurial programs was how to help entrepreneurs secure financing. To overcome this challenge, the university formed the Missouri Innovation Corporation, described above. By establishing an independent nonprofit entity, the university could be directly involved in providing microloans to potential entrepreneurs and small businesses. The Missouri Innovation Corporation houses offices of the federal Small Business Administration. Therefore, potential entrepreneurs seeking financing for their ventures can consult with MIC professionals, as well as meet with Small Business Administration employees, within the same building.

The main challenge faced by the Institute for Regional Innovation and Entrepreneurship is that many regions have no support systems in place for potential entrepreneurs. When discussing entrepreneurial activity, many regional planners claim that the individuals within their region desiring to start new ventures typically leave the region. Therefore, the main challenge faced by the institute's staff has been aiding these regional planners in developing systems to promote entrepreneurial activity, particularly in rural regions lacking a strong

infrastructure (for example, bandwidth) to support new business. The primary focus in overcoming this challenge is using the data analysis mentioned earlier to provide regional planners and other officials with a clear picture of where their region stands with regard to entrepreneurial activity. In addition, the institute provides data-driven recommendations concerning the best use of the resources that are available in regions to promote such activity.

Replication at Other Universities

Replication of Southeast Missouri State's programs at other universities requires a high level of commitment among university administrators. They must be determined to have an impact on the entrepreneurial environment on campus and in their region. These are among the issues that must be considered:

- Finding faculty with practical experience in developing new ventures.
- Developing connections with successful entrepreneurs, possibly through assigned student and faculty liaisons.
- Designing programs to provide experiential learning (such as the Creative Labs and Industries Incubator).
- Creating programs to promote students' entrepreneurial ideas.
- Placing outreach staff members knowledgeable about governmental regulation and support initiatives in accessible locations.
- Promoting and supporting healthy relations between outreach staff and faculty members.
- Developing programs that assist nascent entrepreneurs in securing financing for their innovations.

On the last point, where it may be difficult for some universities to manage microloan funding programs internally, those institutions should seek partnerships with external lending firms. Successful entrepreneurship education programs at

other universities have incorporated many of the components identified above. For example, the Centers of Entrepreneurship at both California State University (CSU) Chico and CSU Fullerton have successfully connected students with regional entrepreneurs to enhance the students' skills and knowledge of entrepreneurship. Chico does this through a Mentors and Apprenticeship program, while Fullerton has an active external advisory board and an annual Business Plan Competition.

At Western Illinois University, the Institute for Rural Affairs is engaging students in entrepreneurship and its impact on the economy by introducing concepts related to entrepreneurship into an interactive game called Up and Out Entrepreneurship Edition. The focus of the game is to provide foundational entrepreneurial principles to students, who then work on developing "their" community in four key areas: how to develop networks; the ever-dynamic workforce; capital and its various sources; and the business climate. Each of the areas helps to cultivate the entrepreneurial ecosystem of the community and educates the participants on what it takes to succeed in entrepreneurial ventures. Recently this program has received favorable reviews and has been expanded to strategic planning activities in Illinois and Missouri.

Assessment of the Effectiveness of Programs

With the proliferation of entrepreneurship programs at AASCU institutions, assessing the impact of those programs is important to determine whether they have achieved their outcomes and justify the resources allocated to them. The impact of on-campus, student-focused programs must be examined, along with that of outreach-based entrepreneurship programs.

Assessment of the effectiveness of programs designed to promote entrepreneurial activity is primarily accomplished through activities that occur outside of the classroom. Southeast Missouri State provides students the opportunity to participate in events and presentations focused on entrepreneurial processes and experience. For example, the Institute for Regional Innovation and Entrepreneurship and the Douglas C. Greene Center for Innovation and Entrepreneurship co-sponsor an event bringing together faculty members from across the campus to present their perspectives on creativity and entrepreneurship. During this and other related events, the university counts the number of individuals who participate, which is

an indication of those who are engaging in entrepreneurial activity through their involvement in learning about entrepreneurship. Student-learning outcomes from each course involving entrepreneurship also are measured.

Assessment of the effectiveness of programs designed to promote regional entrepreneurial activity is done in multiple ways, depending on program objectives. Regional assessment of education programs is determined using SBA and Small Business and Technology Development Center scorecards. These scorecards measure the number of jobs created and retained as a result of outreach programs; the number of new business created through outreach; the number of training session provided by outreach programs; the training hours involved; and the number of attendees at training and assessment sessions. Utilizing these data provides the Institute for Regional Innovation and Entrepreneurship information on the success of its program and the areas where it is having the greatest impact. For example, in 2013 the institute assisted four new ventures (creating seven new jobs) and provided assistance in retaining 130 jobs. Loan programs are assessed by counting the number of loans provided by the Missouri Innovation Corporation, as well as the dollar amounts involved in the transactions.

Conclusion

The United States economy has a long-established history of growth and innovation through entrepreneurial activity. The ability of individuals to create, innovate, and take risks, in a climate that favors entrepreneurship, has been the basis for our continued competitive advantage in technology-based industries. Southeast Missouri State and other universities with programs designed to promote entrepreneurial activity play a key role in regional efforts to enhance and nurture the entrepreneurial competence of students. In addition, AASCU institutions play a critical role in collaborating with partners to promote entrepreneurship in their regions. While the effort to improve assessment of the impact of such programs must and will continue, it is essential to promote the power of entrepreneurship as a force for economic growth, and the university's role in support of that endeavor must to be celebrated.

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Addressing the Workforce Needs of Employers

Robert English and Alister McLeod

Overview

Addressing the workforce needs of local employers describes the innovative outreach initiatives at several AASCU institutions. The strategies of three institutions that have realigned their organizations to more effectively interact with students, faculty, and employers are detailed in this chapter. First, the story of Indiana State University describes how the university's manufacturing and unmanned-systems programs have sought industry collaboration, primarily through the creation of mutually beneficial partnerships in a way that has transformed the curriculum, laboratory experiences, and student/faculty experiences at the institution.

A national center for computing technologies is the basis of the Broadening Advanced Technological Education Connections (BATEC) center at the University of Massachusetts Boston (U Mass, Boston). That narrative details the BATEC's work with public, private, and nonprofit stakeholders to identify educational and workforce-development opportunities.

The third example describes an initiative at Northern Kentucky University (NKU) with the development of its Virtual Co-op Program through the Center for Applied Informatics (CAI). The CAI is used as a vehicle for NKU to provide experientially based learning for its students, research opportunities for its faculty, and potential economic-development opportunities in the field of informatics.

All three universities face common problems involving expectations among participants and interactions between students/faculty members and external groups. The three institutions have chosen different paths in addressing these issues, but in the end, all have sought to find some common ground between the campus and the business/employer community. The primary strategy they employed involves the establishment of a single office on campus charged with

overcoming barriers and promoting flexibility and consistency in communications between the campus and its external partners.

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In her presentation at the AASCU Academic Affairs Winter Meeting in 2013, Jennifer McNelly, president of the Manufacturing Institute, reviewed the "Roadmap for Manufacturing Education" report and made the case that a focus on workforce development is necessary to overcome a significant skilled worker shortage in manufacturing (McNelly, 2013). Also promoting the need for workforce development, the Association for Unmanned Vehicle Systems International (AUVSI) recently released a report titled "The Economic Impact of Unmanned Aircraft Systems Integration in the United States." AUVSI is the recognized leader and largest advocacy group for the use of all unmanned systems worldwide. Its report found that more than 100,000 jobs will be created in aerospace in the United States by 2025, with an economic impact of more than $110 billion (Jenkins and Vasigh, 2013). Likewise AASCU's "Becoming a Steward of Place" publication (2014) declares that higher-education institutions have a responsibility to work with regional business and industry leaders to help ensure that students graduate with the skills needed to support regional development. They also should address their capacity to adapt to future workforce needs (Dunfee, 2014).

The purpose of this chapter is to describe advances that AASCU institutions have made in workforce-development initiatives. Operational insights from Indiana State University, the University of Massachusetts Boston, and Northern Kentucky University are presented. Each section will provide the following: (1) a description of the institutional program, with goals and achievements, (2) a discussion of the challenges faced, (3) the identification of the requirements for success, (4) an exploration of the pathway to success followed, and (5) strategies used to overcome the obstacles. The text will provide operational guidance for colleges and universities on how to promote alignment with their regions' workforces, making recommendations derived from practice.

Workforce Development at Indiana State University

There are essentially two program elements in the ISU story. The first deals with manufacturing, and the second addresses unmanned systems.

Manufacturing: Program Goals. The "Roadmap for Manufacturing Education" mentioned above makes a strong case that workforce development is necessary to fill 600,000 jobs that cannot be filled by qualified applicants in manufacturing (Manufacturing Institute, 2012). The problem is that in the manufacturing world there is a serious need for the following: (1) talent-driven innovation, (2) changes in the nature of work, (3) critical thinking beyond technical skills, and (4) the elimination of deficiencies in science, technology, engineering, and mathematics (STEM) education. (Deloitte Consulting and Manufacturing Institute, 2011; Manufacturing Institute and Accenture, 2014; National Association of Manufacturers, Manufacturing Institute Center for Workforce Success, and Deloitte Consulting, 2005). The crux of the problem is that educational intuitions need to change in order to allow more students to finish academic programs having learned skills that are valuable to employers, as substantiated through third-party, industry-based certifications. Workforce development is essential, and the comprehensive public university is in an enviable position for providing leadership in the development of this workforce.

The Manufacturing Institute and Deloitte Consulting LLP in 2011 conducted a skills survey in which they polled 1,123 manufacturing executives across 50 states. They found that 67 percent of respondents reported a moderate to severe shortage of qualified workers, and 60 percent of respondents said that they were experiencing a moderate-to-severe shortage of skilled engineering technologists. According to the report, manufacturers desire the following (Deloitte Consulting and Manufacturing Institute, 2011):

- More technology-infused postsecondary education alternatives, meeting students and working learners "where they are" and "when they can learn."

- A heightened focus on STEM fields.

- Accelerated pathways to credentials and more "on and off" ramps to postsecondary education to support lifelong learning and improve advancement opportunities.

- More internships and mentorships to align higher education with industry competency and skill requirements.

- A competency-based postsecondary education pathway with opportunities for students to earn interim industry-endorsed certifications in addition to traditional educational credentials such as certificates and degrees.

The suggested quantifiable outcomes for this workforce effort would include the following: more graduates in manufacturing fields; certificates being made an integral part of the academic program; outreach plans with strategic partners; more competency-based postsecondary paths; applied student learning through internships or industrial projects integrated into the classroom experience; and an increase in faculty members working on strategic partnerships as a means of professional development.

Unmanned or Autonomous Systems: Program Goals. The focus of this project element at ISU involves the establishment of an unmanned-systems center to support human-capital development for the 21st century in the areas of homeland security, emergency-response services, and commercial enterprises. Capabilities in unmanned systems provide new methods to address many business and social problems.

The center focuses on developing skills necessary to operate, maintain, and support the transportation, communications, and information infrastructure needed to support operations, research, testing, and development. According to the Association for Unmanned Vehicle Systems International (AUVSI), there will be 110,000 new jobs created in the United States by 2025 in associated fields, and this will result in an economic impact of more than $80 billion. In Indiana alone, the total economic impact is projected to be $1.25 billion in the next 10 years (Jenkins and Vasigh, 2013).

The major goals for this ISU academic initiative include the following: (1) establish partnerships with government, military, and commercial organizations; (2) create a range of education and training programs to include certificate programs, a four-year B.S. degree program for pilots and non-pilots, and a new B.S. degree in unmanned-systems design; (3) establish ISU Aviation Technology as the Safety of Flight Assessment Manager for the State of Indiana's restricted airspace at the state's National Center for Complex Operations (NCCO); (4) pursue contract agreements with military/government/private organizations and research grants for homeland security and for precision agriculture; and (5) create new jobs in the unmanned-systems field.

University of Massachusetts Boston: Program Goals and Achievements

U-Mass Boston's Broadening Advanced Technological Education Connections (BATEC) holds the designation as the National Center of Excellence for Computing and Information Technologies within the National Science Foundation's Advanced Technological Education program. BATEC has the following goals: (1) defining and strengthening academic pathways from high school, community college, and university to prepare students for career opportunities; (2) facilitating strategic and collaborative partnerships between academic partners and industry representatives in order to build awareness, generate interest, and support learning opportunities in ethnically diverse urban areas; and (3) conducting and publishing actionable research to inform policy makers, IT educators, and employers on the subject of workforce development.

BATEC has realized these achievements:

- Reinvented curricula and pedagogical approaches to ensure that IT education is consistent across domains demanded by industry.

- Catalyzed stackable credentials (independent certifications that can be combined to reach an academic goal), articulation, and transfer to build a seamless educational pipeline from high school through postsecondary education.

- Attracted and advanced a diverse population of technology students.

- Connected education, industry, and community in mutually beneficial partnerships that promote career development and support a skilled workforce for regional economic growth.

Northern Kentucky University: Program Goals and Achievements

Northern Kentucky University's Center for Applied Informatics (CAI) Virtual Co-op Program provides cutting-edge experiential learning to undergraduates by managing cross-disciplinary teams of students working on mobile app, website, and analytics projects. Focusing on the quality of the workforce, CAI set the following goals: (1) provide transdisciplinary and developmental experiential learning; and (2) drive economic development around informatics.

CAI has realized the following achievements:

- **Student Impact.** One hundred percent of the student participants have received job offers upon graduation and obtained higher compensation. These students are more successful in the classroom and finish their degrees in a timely manner. The center launched a "professionalization" mini-program, which reinforces skills in professional communication, networking, resume-building, and other soft skills needed to complement the technical and teamwork skills developed as part of the program.

- **Impact on the Technology Sector and Start-up Community.** CAI has provided services to at least 50 projects related to start-ups in a one-year period. This interaction is building an overall entrepreneurial ecosystem across the program.

- **Impact on Enrollment and Curriculum.** Enrollment has increased, and new academic programs were created.

Challenges Faced Across Programs

One of the results of observing the workforce-development efforts of the three institutions was the discovery that the majority of the challenges faced by ISU were also faced by Northern Kentucky University and the University of Massachusetts Boston. This section articulates the shared challenges of the three institutions.

Partnerships. A primary challenge involved the development of strategic partnerships with targeted organizations. The development of substantive partnerships is critical for providing effective attention to workforce development.

ISU partnered with Hurco, a designer and manufacturer of computer numerical control (CNC) machines and machine tools, to solve a problem associated with access to newer industrial-grade CNC equipment. Hurco donated $500,000 worth of simulation software allowing students an improved educational experience working with CNC equipment. This employer's continued partnership with the university will also support the upgrading of industrial-grade machinery in an effort to help ISU with a revival of its manufacturing program. With this infusion of technology, manufacturing teachers in high schools will also be able to facilitate the usage and development of students' skills using CNC equipment within their classrooms. Universities need to focus on creating the systems, processes, and structures to transform education at all levels in a region by developing a coordinated system; this requires strong and effective partnerships.

The Student Factor. Students need to be highly engaged in projects and real-world experience and to see their experiences as relevant to what they will do in the workforce. Student success is defined by the students' ability to meet workforce needs and to complete their educational experiences in a timely and effective manner. Programs have to be flexible in their scope and sequence and offer a rich array of strategies to foster student success. There is a need to develop programs that accommodate the wide range of backgrounds and learning needs that students bring to higher education. At the same time, there is a shortfall of students and graduates who meet the expectations of employers. This is true for the skillsets needed for both internships and fulltime employment opportunities.

Explosion of Knowledge. It is very difficult for universities (and regional employers for that matter) to keep up with the pace of technological innovation. As the faculty work with cutting-edge technologies and the organizations developing and using them, the need for these same technologies in the laboratory becomes critical for providing quality education. Having these technologies ensures that faculty and students possess appropriate skills and are properly able to interface with industry when opportunities arise.

Articulation and Transfer. The challenge involves articulation and transfer systems that build a seamless educational pipeline from high school through postsecondary education. This pipeline ensures that students do not have to spend five to six years progressing from a two-year degree to a four-year degree. The greatest challenge associated with an effective articulation system is working with high school and community-college systems to come to formal agreements on how to make collaboration work for the student and employer.

The Presence Factor. It is necessary for students, faculty, university centers' staffs, and leaders of external organizations to spend time together if they are going to understand each other's needs and priorities. There are significant, serious problems that cannot be resolved without each partner investing a substantial amount of time and partnering in new, meaningful ways. An example of such a problem involved a serious need for manufacturing companies to have access to manufacturing specialists with expertise in computer aided design (CAD) and CNC operating expertise (Cimatron Group, 2013; Savoy and McLeod, 2014). To solve this issue, ISU has started to upgrade its labs and also reinvest in its faculty to enable the training of potential manufacturing specialists. NKU has also done the same through its Center for Applied Informatics. These efforts are a necessary part of training students and creating supportive environments for faculty-industry collaboration.

Generating External Dollars. Many comprehensive institutions are feeling extreme pressure due to budget cuts. The challenge is to find external organizations that have financial resources and the desire to create new products and processes in similar technological markets.

Curriculum. There is a distinct need to align curriculum with the demonstrable job/skill needs of the region. The question becomes, "How can higher education become more aware of the private sector needs?" Employers want academic programs that optimally fulfill their needs, and to accomplish this, higher-education institutions must listen and incorporate these needs into the process of developing the curriculum.

In notable cases, employers have shown a willingness to invest their time and money in relevant academic programs. For their part, universities need to transform their curricula and pedagogical approaches to ensure that education is relevant, standards-based, and includes the critical skills demanded by industry.

Need for Credentialing with Emphasis on Accelerated Pathways. There is a need for stackable credentials, with an emphasis on their integration into degree paths. There is also a need for more "on and off" ramps to postsecondary education to support lifelong learning and improve individuals' advancement opportunities. These competency-based postsecondary credentials make it possible for employees to earn interim industry-endorsed certifications with value in the workplace, as well as the traditional educational credentials such as certificates and degrees.

Culture. Higher education does not understand how the private sector operates and the reverse is also true. This is due primarily to the fact that the cultures of the two organizations are so different. To overcome this, the leaders of both types of organizations need to work together to understand the goals and motivations of the other sector. Higher education needs to develop curricula that will produce an appropriately skilled workforce, and employers must find the means to communicate their expectations for qualified employees. Under the best of circumstances, curriculum development requires a team-based approach, with educators and industry partners working together to explore emerging technologies while incorporating the necessary technical knowledge and skills. This approach represents a substantial change in culture for both faculty and employers. For this to happen, faculty members must rethink how they teach, what they expect from students, and how they interact with their peers.

The Requirements for Success

A review of the three workforce-development efforts described in this chapter makes it clear that there are similarities among successful programs. The following list summarizes the key requirements that leaders must consider:

- An outreach plan should highlight curriculum development as a benefit of strategic partnerships and workforce-development activities.

- Emphasis must be placed on the primary benefits of strategic partnerships—applied student learning and faculty development.
- The development of undergraduates' research and problem-solving skills must be a priority of strategic partnerships.
- The pathway for external individuals and groups to access university resources must be standardized and widely understood.
- Clarifying the role of sponsored programs and research offices is essential to support legal and financial requirements.
- Development of workforce partnerships should be centralized and handled at the senior institutional level.
- Planning should emphasize alignment of the curriculum with future regional requirements for workforce development.
- Data about the value of partnership and workforce-development activities must be collected and shared with internal and external constituents.
- Information on the value of institutional engagement should be made public to garner community and regional support.

Strategies to Overcome Obstacles

As every institution strategizes about how best to strengthen workforce training, there are critical considerations that will promote success. The list that follows is adaptable to every institutional type and geographic setting. Recommendations include:

- Develop written partnership agreements with a clearly defined set of mutually beneficial outcomes that bring value to each party over time. This imperative requires the university and the private-sector partners to develop a program that meets workforce needs and responds to alternative credentialing. Achieving these objectives may require the university and the employer to jointly find

the necessary expertise if it does not exist on campus. A major challenge is the development of partnership instruments that establish clearly articulated outcomes, schedules, responsibilities, obligations, and/or contributions. The memoranda of understanding or agreement should align the relationship to enable the parties to confront specific challenges and achieve desired outcomes. It should negotiate the framework of acceptable performance and outcomes and identify who is responsible for the achievement of the outcomes.

- Universities need to support research and development as interdisciplinary and inter-institutional activities and also to engage external partners. By encouraging faculty/student involvement in these projects, faculty members have opportunities to stay current in their field, students can develop applied workplace skills, and employers can gain access to innovative technologies.

- A priority needs to be placed on the development of a culture of innovation. Universities need to utilize their expertise to innovate through the creation of new academic programs and services that connect educators, industry advisors, government officials, and thought leaders. This is done to advocate and facilitate educational reform to address the significant challenges facing the workforce-development needs of our country. One way of impacting the culture is through the process of hiring new faculty members or making resources available to faculty who want to develop a more open perspective concerning the value of engagement. One strategy to impact the culture is for faculty to attend trade shows, conventions, and/or conferences. This provides an opportunity for faculty and students to observe what new material needs to be inserted into the curriculum and to understand the dynamic changes taking place in the field or profession.

- Curriculum-development efforts must center on a team-based approach, with educators and industry partners working together to explore emerging technologies while interweaving the requisite technical knowledge, required employment skills, and entrepreneurial capabilities into the curriculum. This will result in faculty members thinking differently about how they teach, what they expect from students, and how they interact with their peers.

- Student success needs to be central to the engagement/outreach strategies. One important way of doing that is through a coordinated but flexible system of integrating "stackable credentials" with degree programs. The alignment of these career paths between high schools and two-year and four-year colleges is also essential. The adaptable education plan should allow students to gain valuable credentials, such as industry certifications, that let them become employable earlier while continuing to grow academically and professionally. It also helps institutions increase completion rates as students see these intermediary steps as less daunting than a full degree program. Investing in this blended and sequenced workforce development, if properly done, also will result in attracting more students to the programs.

- Partner with the regional small-business development centers and centers for entrepreneurship as they strive to meet the needs of start-ups. There is substantial evidence that entrepreneurship efforts can be classified as workforce development, and for the overall health of the regional economy, entrepreneurial capabilities offer valuable skill sets. Many employers need to participate in the development of the "total student." This requires co-curricular transcripts that illustrate the students' soft skills (oral and written communications, problem-solving, creative thinking, etc.), and also lists certificates, internships, applied research experiences, and other professional contributions.

- Make sure to develop the communications capabilities to promote an appropriate response to an employer request. Universities with unique niche expertise will have business, industry, and governmental organizations approaching them for development of partnerships. When a university receives a "cold call" there needs to be a referral system so that the opportunity for the university is not lost. When the university does have niche expertise, the "cold call" needs to eventually make its way to the right person who can begin to develop the relationship and seek external help. Industry and government agencies know there is a high level of expertise at universities and thus want to develop collaborative relationships. Industry and government agencies want to leverage their expertise with that of universities in a mutually beneficial way. To facilitate partnerships, centers are necessary to help develop changes in culture and to provide services to industry and government agencies.

Assessing the Program Impact

An integral part of Indiana's prominence in the field of manufacturing is derived from its postsecondary-education system. In particular, vocational technology programs at both four- and two-year intuitions have attuned their curricula and labs to meet the needs of the state's employers. It should be noted that in Indiana the manufacturing community is not dominated by large employers. Instead, 98 percent of Indiana's manufacturers employ fewer than 500 workers per facility (Bureau of Labor Statistics, 2014).

The manufacturing program at ISU educates people who are sought by these modern manufacturing entities. Graduates of the manufacturing program are capable of working in a manufacturing facility that requires multi-faceted skills and a wide range of expertise, drawn mainly from the fields of electronics, and mechanical, control, systems, computer, and software engineering. The process of getting students excited about manufacturing and its relationship to engineering has to start at the high-school level.

In five years, with a change in strategic direction focusing on workforce development, the ISU College of Technology's enrollment has grown 82 percent, and it has developed six new academic programs and increased students' retention, with the college now leading all other colleges in the university in terms of the percent of students graduating in four years. In addition, there has been a substantial increase in industrial donations of software and laboratory equipment, gifts now totaling approximately $10 million in the last five years. Students are in great demand by employers, with a large percentage of them having a job offer in hand six months prior to graduation. Because of internships and work projects, there is a much higher level of engagement taking place in the classroom as students have a greater understanding of the demands in the workforce; therefore, the subject matter has become much more relevant to them. More students are attending trade shows, conventions, and conferences, allowing them to develop an enhanced understanding of the current trends in their field/profession. Many faculty members require reading of professional periodicals in their classes and include it as part of testable content, which facilitates the attainment of current knowledge in their fields.

Conclusion

In sum, the emphasis on meeting the workforce needs of employers has served to improve the learning outcomes for students. This should be the ultimate goal of any workforce development effort—improving the quality of the educational experience.

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Promoting Productive Public and Private Partnerships

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Overview

Academic institutions must rethink their missions in order to respond effectively to calls for expanded service to their regions. An opportunity exists for regional comprehensive public institutions to improve the development of public-private partnerships that benefit their communities, institutional leaders, the faculty and staff, the students, and the public-private sector partners. Creating a focal point to facilitate collaboration among higher education, industry, government, and research communities strengthens regional engagement and advances educational and economic interests.

University leadership needs to see partnership activity and innovation transfer as a way to overcome reductions in state support. The changes need to occur in the curriculum and in institutional outreach so that the university can serve as a prime resource integral to regional growth and sustainability.

Approaching this challenge, McNeese State University, the administration of Calcasieu Parish, the Southwest Louisiana (SWLA) Economic Development Alliance (Chamber of Commerce), and the City of Lake Charles, La., formed a partnership to create the Southwest Louisiana Entrepreneurial and Economic Development (SEED) Center. This initiative was conceived to enhance economic development for the state and establish a "one-stop shop" for economic-development services in southwest Louisiana. Thus, a number of campus offices offering business services were consolidated through the SEED center.

The outcomes of the services offered through the SEED center are reported under each program element. In addition, the experiences of a number of similar programs throughout the U.S. are presented and their outcomes are catalogued.

The necessary steps in the process of the development of these types of industry outreach programs that require extensive partnership support are detailed in this

chapter. In addition, the challenges faced by many who work in higher-education outreach are summarized and strategies for overcoming the challenges are presented.

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Partnership

"The fact or condition of being a partner; association or participation; companionship" (Oxford English Dictionary, 2014).

"An arrangement where parties . . . agree to cooperate to advance their mutual interests" (Wikipedia, 2014).

Why Partner?

Over the past 20 years, demands on higher education for more accountability have evolved simultaneously with declining financial support. Persistent public conversation seems to question the very value of higher education. The internal and external issues causing tremors in fundamental beliefs about the value of higher education include factors such as accountability, the rising cost of tuition, student debt, and the conflict between immediate earning and the potential for earning higher salaries with advanced degrees. With those realities as a backdrop, regional academic institutions must rethink their delivery models and missions, not just for accreditation reasons, but also to fulfill a "revised" and innovative educational mission for the regional university.

An opportunity exists for American Association of State Colleges and Universities (AASCU) institutions to improve upon public-private partnerships that benefit all parties: the institutional leaders; the faculty and staff members; the students; the public-private sector partners; and the local communities they serve. Creating a focal point to facilitate collaboration among higher education, industry, government, and research communities serves to strengthen regional engagement and advances educational and economic interests. Examples of these types of partnership efforts are appearing across the nation:

The University of Southern Maine (USM) is creating public-private partnerships by supporting development of faculty-led multidisciplinary research clusters that work with the private sector, other institutions, and the community. These clusters "bring knowledge to bear on issues of intellectual, scientific, humanistic, social, economic, environmental and cultural importance" (USM, 2014). One program, the Maine Cyber Security Cluster (MCSC), seeks partnerships with business, industry, and government entities in pursuing cyber-security awareness, education, research, and development. The MCSC Executive Board is comprised of business, industry, government, and military leaders in the cybersecurity domain. Multiple partnerships have been formed with USM that include presentations on state and national issues, as well as invitations to develop and conduct educational programs that focus on cybersecurity. Collaborations are beginning to emerge that include students, faculty members, and staff (USM, 2014).

Another example is the Enterprise Campus Research Park at Louisiana Tech University, which seeks to partner with high-tech companies that will benefit from the "intellectual, commercialization and research strengths" that the institution has to offer (Louisiana Tech University, 2014). Louisiana Tech University and Louisiana State University jointly established the Center for Secure Cyberspace to assist faculty members in their research and to support federal, state, and private-sector cyberspace security, including the Cyber Innovation Center in Bossier City, La. (Louisiana Tech University, 2014).

Regional Engagement at McNeese State University (MSU)

To address both the crisis of declining state financial support and promote priorities for regional growth, MSU, in Lake Charles, La., identified an opportunity and launched a strategy to advance the university in a creative and meaningful way that meets the higher-education needs of students and the region. For McNeese State, state appropriations have declined 49 percent from 2009 to 2014 while tuition has increased 81 percent. The decline in state funding is a clear signal that higher education does not hold priority status in the state budget. Therefore, the university's leadership sees partnership and innovation, both in the curriculum and as an institutional-outreach strategy, as important factors that enable the university to serve as a prime resource integral to regional growth and sustainability.

Outreach Center. In 2008, McNeese State University, the leaders of Calcasieu Parish, the Southwest Louisiana (SWLA) Economic Development Alliance (Chamber of Commerce), and the City of Lake Charles, La., formed a partnership to create the Southwest Louisiana Entrepreneurial and Economic Development (SEED) Center. This initiative was conceived to enhance economic development for the state and establish a "one-stop shop" for economic development services in southwest Louisiana. In 2010, the university committed property and was awarded funding from the U.S. Economic Development Administration for the SEED center. The City of Lake Charles, Calcasieu Parish, the Community Development Block Grant Program of the U.S. Department of Housing and Urban Development, and the SWLA Economic Development Alliance signed partnership agreements to commit funding to construct the SEED center.

The center is a 52,315 square-foot, three-story, multiuse building located on eight acres owned by McNeese State. The center is located in an area with a highly diverse regional economy with a wide array of opportunities to attract entrepreneurs and create quality small businesses providing high-paying jobs. The center houses 32 business incubator offices, the SWLA Economic Development Alliance, the Imperial Calcasieu Regional Planning & Development Commission, and the following MSU offices and programs: the Louisiana Small Business Development Center (LSBDC), the Innovation Center, the Institute for Industry Education Collaboration (IIEC), the Internship Program, and a U.S. Economic Development Administration (EDA) University Center. Locating the facility on a university campus centralizes support services for educational expansion, enhances economic growth and sustainability, encourages innovation through strategic collaborative arrangements, and promotes new business ventures and diverse entrepreneurial efforts in southwest Louisiana.

Regional Partnerships. McNeese State, in collaboration with the local chamber and its civic, business, and governmental constituents in a five-parish (county) region, developed a leadership role as a facilitator of collaborative projects. Through the SEED center's infrastructure (networks, research offices, economic-development providers, and professional contacts), students, faculty members, and private representatives become engaged in exploring solutions to various issues and creating increased productivity for all parties involved in the collaboration. The center continues to lead in the promulgation of creative ideas and a variety of partnerships. The university's partnerships include:

- "Banners at McNeese," a cultural program series promoting arts and humanities.
- Calcasieu Parish public-health programs.
- The City of Lake Charles nature park biological survey and arboreal inventory.
- The Innovation Center curriculum, licensed through the University of Maine.
- The Fort Polk military installation's offsite educational program.
- SOWELA Technical and Community College articulation agreements.
- Industry-specific customized training, education, and professional development.
- The McNeese State University Center for Advancement of Meat Production and Processing (CAMPP), involving agreements with private businesses (grocery, restaurant, and other food-related businesses) for distribution of meat products, food safety education, and training programs.
- Industrial complex and environmental company collaborations to conduct coastal restoration and environmental work, and catalyze development.
- The U.S. Army Corp of Engineers and local port authorities for water/sediment transport simulation and analysis of sediment transport.
- Assistance for local port authorities for small-business development and relocation to support the liquid natural gas sector.

Quantification of outcomes resulting from the center's partnerships is difficult due to non-comparable data-collection procedures and the overlapping and complex nature of partnerships among the Chamber of Commerce, various university centers and programs, and other entities (e.g., county/city government and community, industry, and business organizations). In addition, the reported outcomes exclude the conventional activities of individual university colleges' community partnering activities. The latter include the College of Nursing's clinical nursing experiences, the Burton College of Education's assignments of student teachers to K-12 schools, and the College of Business's internships. With those qualifications, we can list some examples of SEED's operational outcomes:

- The EDA University Center facilitated approximately 90 different partnerships and regional-engagement activities during the 2013-14 fiscal year.
- The Institute for Industry Education Collaboration (IIEC) offered 37 customized training and professional-development sessions to 484 employees at 118 companies between February and July of 2014.
- The Undergraduate Scholar and Research Symposium in 2014 involved seven applied projects that addressed local business and industry issues. Members of the business community who attended the symposium displayed interest in future collaborations.

- The SEED center reported in 2014 that an estimated 59,800 jobs were created by projects already in progress or planned in the near future (SWLA Alliance, 2014).
- Economic-impact statistics for the Louisiana Small Business Development Center at MSU for FY 2013/2014 (Oct.-Sept.) were positive, as shown in Table 1.

Table 1. LSBDC at MSU statistics, FY 2013/2014

Statistics (milestones)	Total
Jobs Created	20.5
Business Starts	10
Capital Raised	$4,066,964
Counseling Overall (# of clients)	297
Counseling Hours	995.22
Training Attendees	411
Training Events	23

Global Partnerships. The next decade in southwest Louisiana will see a large investment in economic growth with more than $80 billion in announced industrial projects for the Lake Charles metropolitan statistical area (Scott et al., 2014). With southwest Louisiana experiencing investment by foreign companies. MSU's accountability will be gauged by the quality of education that ensures students possess the advanced skills and knowledge required to meet the region's workforce needs. The university also will be evaluated on its leadership in development of regional capacity, civic responsibility, and meaningful engagement with the public-private sector. Building a network of business partners who have access to the intellectual capital and creative skills of faculty members and students provides an opportunity for the university to lead collaborative and strategic alliances that further the region's knowledge economy.

Considerations for Developing Partnerships

Developing partnerships at the local level depends on the institution's mission, offerings, and communities served, as well as local, state, regional, national, and international relationships. There is no one-size-fits-all template that works for every institution. However, identifying opportunities, leveraging momentum, having the right individuals in place to pursue/negotiate prospective partnerships, and basing relationships on strong academic offerings provide the foundation for

successful partnerships. Contributing academic intellectual capital to businesses and communities trying to succeed in a competitive global market enables knowledge transfer. This creates the opportunity for students and faculty members to engage in applying innovative discoveries, methodologies, and technologies for the public good.

For example, in Michigan Saginaw Valley State University's Saginaw Bay Environmental Science Institute (SBESI) is focused on environmental science and citizenry in the Saginaw Bay area. This institute's work involves collaborative efforts by faculty members and students with educational, scientific, governmental, and community partners. Some of these efforts include expansion of STEM (science, technology, engineering, and mathematics) experiences and programs focused on the local watershed. The institute thus serves as a scientific resource for facilitating land- and water-management practices and also provides opportunities for student and faculty service learning (Saginaw Valley State University, 2015).

Seeking individuals interested in collaboration, recognizing opportunities in the region, using the momentum created by realignments of academic mission, highlighting successes, and promoting an entrepreneurial spirit can increase engagement by students, faculty members, and citizens. Students benefit from experiential learning, application of knowledge, and interacting within a business/industry environment with faculty members and business partners on real projects. In an internship or educational cooperative, a student will receive real-world experience in a desired discipline while employers receive an employee at a relatively low cost with low risk, for a trial period. This experience also may provide the student with opportunities for future employment. In addition, the student's faculty mentor could benefit by learning about business/industry approaches and staying abreast of emerging issues or trends in the field and translating them into content knowledge, curriculum development, and new discovery.

If one institutional goal is to build partnerships, then this goal should be included in the institution's strategic plan. Institutional strategic plans may include a focus on regional engagement, applied research, and a leadership role in community and economic development. The primary purpose of an institution's strategic plan should be to serve as a roadmap to guide administrative decision-making, including the setting of budget priorities, in a manner consistent with the role,

strengths, and mission of the institution. For long-term success and growth of partnerships, alignment among leadership, the strategic plan, and academic-support offices must be clear and transparent. Buy-in from all levels of the institution creates the momentum necessary to sustain the investment in building successful relationships.

The concept of public-private partnerships is interpreted broadly by the leaders of a variety of arrangements that may constitute a partnership. If carefully developed, a partnership may be structured to provide a new source of fiscal and educational investment relevant to both the mission of the academic institution and the partnering organization(s). Collaboration can involve a university administrator, faculty member, department, center, or cluster of faculty members in a department engaged in a long-term or a short-term project. The project ideally should provide student internship and employment opportunities.

In the event an institution does not have a faculty or staff member with the particular type of expertise needed in a partnership, the institution can act as a facilitator for obtaining the requested service and can coordinate the delivery of the necessary support. Fee structures should be in place for offering different types of services, including non-traditional education and training, professional development, consultation and professional support, testing, analysis, research, and revenue sharing. Regarding the latter, pricing structures for revenue-generating programs must be in line with market value, federal regulations, and state policies. Other revenue streams from the private sector can be garnered through technology transfer and faculty expertise (consultations). Care must be taken to ensure academic freedom and ownership of intellectual property are not diminished in arrangements in which the private sector funds the research.

Cultural offerings provided by a college or university can foster social and economic-development initiatives that benefit the region and promote partnership opportunities. From science and humanities lectures to music and dance, cultural offerings engage area residents in educational programming designed to develop creativity, innovation, and entrepreneurial thinking. The positive synergy that develops from accessing diverse resources encourages growth and prosperity.

For example, the “Banners at McNeese” cultural program features a series of concerts and other programs promoting the arts, humanities, and cultural

diversity celebrating the unique heritage of southwest Louisiana. Banners also offers programming for children and "seeks to enhance the quality of life in [the] community while making the region more attractive to people and businesses relocating to Southwest Louisiana" (McNeese State University, 2014).

Academic institutions and companies have at least one goal in common— they are both interested in recruitment and retention. A partnership between an institution and an organization can result in a symbiotic relationship that helps both entities achieve this goal. The presence of an institution of higher education and the quality of its programming can help organizations recruit and retain qualified talent. And through internships, applied research, and other services, the university can establish positive student interactions outside the classroom that increase student recruitment and retention.

Challenges

When a project involves external and cross-departmental collaboration, the possibility for tension exists. Internal friction over perceived territorial issues or "ownership" of certain subject matter may occur. These political skirmishes or disagreements over control can have a negative effect on the success of the partnership. Further, in some circumstances individuals are not skilled enough to carry out the established vision or key individuals may leave the institution or partnering organization. The institution should consider having a plan to address conflicts or unforeseen breakdowns in project management.

Whether constructing a facility or embarking on new projects, institutions may encounter some common challenges. Obtaining approvals and constructing a state facility with multiple partners and funding sources requires the ability to deal with major regulatory obstacles, while remaining positive and focused on the common objectives of the project.

Although the outcomes are worthwhile, the challenge of managing many partnerships, drafting and approving agreements, securing funding, managing multiple funding budgets, navigating funding regulations and requirements across public and private agencies, reaching consensus, avoiding political pitfalls, and communicating effectively requires patience, good negotiation skills, and flexibility.

To promote and grow public-private partnerships, one should recognize that higher education and business/industry frequently have missions that are not convergent or even complementary. Business and industry focus on profit and satisfying stockholders while educational institutions focus on education, research, and service.

Part of the higher-education paradigm is the ability to publish and present findings publicly. However, business and industry's existence is based on the ability to protect intellectual property and quickly bring products, processes, and services to the marketplace. In the United States, companies have a limited amount of time to file a patent once the invention is disclosed to the public. Therefore, leaders in business and industry often want to review or approve ahead of time any relevant presentations or publications by their educational partners.

Another challenge involves inaccurate perceptions that limit the growth of mutually beneficial partnerships. For example, one perception that can inhibit collaboration is the idea that higher education is just another form of government with too many bureaucratic processes. This perception can be addressed by actively sharing stories of successful partnerships through media and print sources, websites, and marketing materials. Accommodating cultural differences, communicating expectations and limitations, finding workarounds, addressing perceptions, and building trust all contribute to the foundation for a long-term successful partnership.

Going Beyond the Challenges

Academic institutions must not be afraid to fail. As pioneers of any new frontier, institutions should not prevent themselves from exploring partnerships due to a fear of failure. Institutions constantly should consider exploring new ways to grow networks and create opportunities for relationships through innovation and collaboration. Learning from failure, determining what works, strengthening the positives, and addressing the ineffective is a continuous cycle in any partnering endeavor. Becoming trapped in the planning phase (as opposed to implementation or action) is all too common and detrimental to success. Academic institutions should not be afraid to try something new and discontinue efforts that are no longer effective. Mediocrity and stagnation damage partnering operations, waste intellectual capital, and exhaust creativity.

Planning and Management Factors. Building on a culture of collaboration and regional engagement is more effective when the institutional strengths, weaknesses, and internal/external opportunities and threats have been identified and a strategic plan developed. Continuous buy-in from faculty members and staff is essential in establishing a collaborative mindset within a college or university. Building on good will and value-added actions, while maintaining academic freedom and a focus on the educational mission of a regional academic institution, is part of the formula for success in public-private partnerships.

There are many resources available to assist with crafting partnership agreements, interpreting regulations, and developing associated policies and procedures. In addition to the AASCU Grants Resource Center, other organizations such as the National Council of University Research Administrators and the Association of University Technology Managers offer knowledge, resources, and professional networks that aid in the management of such efforts. Institutions should have template agreements and sample language for different arrangements. Some of the instruments frequently used in establishing partnerships include memoranda of understanding, material transfer agreements, and agreements specific to research, non-disclosure/confidentiality, testing and analysis, and consulting. Transparency is critical when dealing with federal, state, or in-kind support; therefore, it is essential to have effective management, accounting, and reporting systems.

Partnership Factors. Strengthening and defining relationships with institutions that grant associate degrees and public-private K-12 schools increase the quality of education and provide benefits to students, institutions, and the community. In addition, institutions should re-examine opportunities for adult learners, including opportunities for advanced education, customized training, and professional development that benefit the region. Working with employers to provide advanced education for employees creates partnerships as well as potential streams of revenue. In such arrangements, the institution can benefit by an increased demand for professional-development programs, which in turn boosts demand for the related degree program.

Collaboration also strengthens funding proposals and requests. Local government administrators, chambers of commerce, and existing business partners can provide matching dollars, support efforts through phone calls/letters/emails, host meetings,

and facilitate introductions with key constituents. But these agencies must see value in the proposal or request. How the funding application will benefit the agency, support its constituencies, or make its decision-making processes better should be clearly stated.

Leadership Issues. Institutional leadership should consider this set of questions when exploring and developing academic-based partnerships:

- Do you have a pipeline or mechanism in place that enables a continuous flow of knowledge, solutions, and opportunity for all involved?
- Do you have a professional network of peers across your state with whom you can consult?
- Are you increasing awareness about your offerings? Which offerings?
- Do you want to grow existing partnerships or build new ones? In what areas? What type of partnership do you want?
- Who is your "customer"?
- Which industry/business/other sector are you targeting? Are you pursuing emerging or established industries/organizations or both?
- Does your institution have research, expertise, or programs that could benefit local organizations? If so, how do you share this information with the public?
- How can ABC Company (which is interested in partnering with the university) find you? Do you have the right people in critical positions?
- Do you have an obvious, established presence (physically and online) described in language that business and industry understand?
- Do you list your resources and expertise in a way that enables organizations to easily identify a point of contact for their requests and also encourages new partnerships?

Advice for Institutional Leadership on Partnership Development

There should be a mutual benefit for all involved when establishing long-term, sustainable relationships. For many years, academic institutions have included community service as an integral part of developing academic partnerships. However, community service reflects an arrangement in which only some parties may provide and receive something of value. A true partnership requires the exchange of value for value.

Colleges and universities contribute to economic and intellectual development through a variety of strategies:

- Graduating an educated citizenry in their region.
- Facilitating innovation efforts and cultivating regional ecosystems for innovation.
- Offering technical assistance, certifications, and professional and customized programs for workforce development.
- Conducting applied research to solve local problems.
- Fostering business incubation.

All of these contributions need to be tracked in detail as institutions consider their contributions to regional prosperity.

Understand the Landscape. Understanding the economic, political, and geographic landscape is necessary for an institution to identify success-oriented partnership opportunities. Key staff should possess an in-depth knowledge of the region in which the institution is located, and this knowledge should include: industries/fields and economic sectors represented, key stakeholders/decision-makers, economic-development entities/providers, and state and local developmental resources. This knowledge can be used to assist faculty members and other professionals within an academic institution who are seeking opportunities to apply their expertise to address local issues.

Keeping abreast of legislation impacting the institution's region enables the mobilization of assets and the preparation for action with partnering organizations. Strategies also should include identifying regulatory requirements, demographic trends, changes in consumer behavior, and potential challenges being faced by key employers.

Seek a Balance. Institutions of higher education also should seek a balance between supporting faculty freedom to discover and explore new realms and promoting the application of existing knowledge and expertise to specific concerns and issues. Both basic and applied research may lead to partnering opportunities. These partnerships can increase recognition and appreciation of the value added from university resources. However, every potential partnership should be considered from the perspective of its impact on the university. Individual institutions can define the value and benefit derived from a potential collaboration when determining whether to enter into such an arrangement.

Identify the Institution's Assets. When advocating for partnerships, academic institutions should possess an in-depth understanding of their own activities, products, processes, services, resources, and other marketable assets. The collective knowledge in a college or university serves as a reservoir for developing information about potential applications. Academic professionals with knowledge and experience in their respective disciplines are an indispensable resource when developing a deeper understanding of campus capabilities. For example, provosts, vice presidents, deans, department heads, research administrators, librarians, experts in economic development, foundation staff, and government-relations liaisons may serve as points of contact for determining the baseline of available resources. Collecting existing knowledge that exists in pockets of the institution is important to the development of an "inventory" listing university assets and capabilities.

Identifying intellectual capital (e.g., faculty expertise, qualifications, certifications, industry experience, research and other interests); resources (e.g., equipment, labs, facilities, and technologies); and student contributions (e.g., internships, student research, and capstone projects)—and then compiling these assets will benefit development of partnerships. However, an inventory of these resources in and of itself is not enough to promote successful regional engagement.

Establish a Communications Infrastructure. A visible office or contact can serve as an initial resource with which entities can connect for assistance to meet their needs. This reduces the frustration of a phone caller being passed around to different representatives on campus and provides an obvious point of contact for companies or organizations. This structure also ensures that the role of such an office/liaison is understood internally. Managing introductions and relationships with feedback opportunities and follow up will help efforts progress.

Work with the Right People. Having the right people in place to negotiate agreements, interact with the public and faculty members, attend events, problem solve, advocate, build consensus, facilitate opportunities, work with local/state leaders and elected officials, understand and work with state/federal agencies, and connect with industry will help achieve positive results. These individuals can be found on-campus, off-campus, or through professional contracts, and can be part-time or full-time employees, depending on budget constraints, mission, and the size of the institution. Finding individuals who fit a position is often

a matter of trial and error. However, identifying individuals who understand meeting management, institutional priorities, the political environment, and who possess essential traits (collegiality, social adeptness, organization, patience, and flexibility) can reduce the risk of putting the wrong person in a crucial position. Placing the right people in the right settings may assist the institution in realizing its partnership goals and can lead to many benefits, including expanded networks and continuous engagement.

College or university representatives who are knowledgeable about the region's infrastructure and business environment, network with community leaders, and are familiar with the work, research, and expertise of faculty members can facilitate meetings between members of the institution and the community. These representatives can target groups (e.g., local civic groups and professional organizations) with whom to share institutional information and provide presentations regarding success stories and institutional achievements. Advocacy and framing the conversation to promote university capabilities helps make the case for how partnering with the university benefits public and private organizations.

Communicate a Consistent Message. Good communication overcomes barriers by clearly outlining what the institution and partner expect to gain and contribute. Clear communication is fundamental to growth, smooth interactions, and positive impressions. Perception is important and an ongoing dialogue with community leaders (existing or potential partners) about the academic institution's intellectual capital and resources can create new opportunities. Describing institutional priorities and discussing potential obstacles (regulatory restrictions, purchasing, hiring, accounting, and auditing policies), without discouraging or intimidating a potential partner, builds trust. In addition, open dialogue with collaborators about an institution's limitations while outlining strengths and contributions reduces confusion and creates mutual understanding.

When discussing the possibility of a partnership and asking for project support, institutional personnel should provide a simple handout or other material describing the institution's proposed project and highlighting the benefits for all parties in language everyone can understand. When working with a private-sector partner, it is important to ensure that public communications or other material have been reviewed by that entity before release. Sharing a story publicly without

giving the other party an opportunity to review the release and make corrections can negatively affect the partner's trust, your credibility, and future progress.

Build a Network. Networking is a powerful tool for building partnerships. Meeting individuals at both formal and informal events develops networks and increases visibility of the institution's commitment to its vision. Academic partners who develop good working relationships with company/industry representatives and with the local chamber of commerce and other community organizations can further the institution's enterprise. Academic affiliates strengthen their ties to the region by attending events sponsored by chambers of commerce and businesses, serving on civic and other community-based committees, and working with state, local, and other community-based staff members. Arranging for visiting officials and economic developers to meet the chief executive officer (CEO) of the chamber of commerce and other community leaders reinforces the important role an institution plays in the community and region, and strengthens chamber of commerce/community relationships with the university.

In turn, encouraging the chamber of commerce and other important organizations to allow a university representative to meet their visitors and promote the institution can help recruit companies and employers to the area. This reciprocal arrangement has the added benefit of increasing the university's professional networks and presence in the community and may help with establishing new partnerships.

Joint ventures with local officials (e.g., the mayor, city and county administrators, as well as their key staff members) are vital to partnership development. Recognizing the needs of community leaders and elected officials can create cooperation and an opportunity to collaborate. These individuals may be in positions to advocate for the academic institution with businesses, the state, and other agencies. These officials also can be a source of funding for high-impact local projects, which often are very visible and easily shared as success stories. Sharing the stories of successful partnerships with state economic-development entities and documenting evidence of such partnerships helps build state portfolios that help recruit and retain academic professionals as well as businesses.

Tell the Right Story. Appropriate marketing is important, based on ideas from traditional marketing offices but also on input from faculty members and

students having expertise in academic disciplines related to marketing and mass communications. Targeting faculty members, staff, and students who have interesting and relevant information to share and then telling their story through social media, websites, local magazines/publications/newspapers, and state media outlets can build momentum for partnership opportunities.

For example, the University of Texas-Pan American's Civil War Trail project is a partnership with the community that brings cultural and historical enrichment to residents of the Rio Grande Valley and stimulates the economy through heritage tourism. Visitors use a bilingual website, podcasts, and a map/guide/brochure with quick response (QR) codes to virtually tour historical Civil War sites in South Texas and learn about the forts and battlefields where skirmishes and battles took place. Project participants also plan to work with local educators to incorporate the Civil War Trail project into the Texas history curriculum (Revilla, 2015).

Celebrate the Successes. It is important to recognize and celebrate successes, whether large or small. Institutional employees should always know that their efforts are recognized and appreciated by the institution's leadership. There are non-monetary ways to recognize faculty and student efforts, including "thank you" phone calls, awards, luncheons, newspaper articles, website features, and a myriad of other innovative approaches.

Metrics and Assessment

Establishing metrics that assess university contributions to regional and national economic growth continue to be a priority for many public agencies. Emphasis is now placed on metrics that go beyond measuring traditional indicators such as the number of patents filed and licensing agreements executed, revenue from licensing fees, and equity investments returned to the institution. Organizations guiding efforts to establish assessment indicators that measure contributions to local, regional, national, and global economies include: (1) the Association of Public and Land-grant Universities (APLU) Commission on Innovation, Competitiveness, and Economic Prosperity (CICEP); (2) the Science and Technology for America's Reinvestment Measuring the Effects of Research on Innovation, Competitiveness and Science (STAR METRICS) program; and (3) the Association of University Technology Managers (AUTM).

The STAR METRICS program provides a mechanism to measure the impact of scientific investments stemming from federal research and development. The AUTM approach for the Institutional Economic Engagement (IEE) Index is intended to stimulate discussion and offer a range of measures that capture key components of knowledge transfer and economic impact (AUTM, 2015).

Assessing, articulating, and quantifying the benefits of a multi-faceted ecosystem with multiple channels for knowledge flow, and measuring the influence of the academic institution on the economic impact created by external partners are challenging. Data for projects that often have long term benefits—jobs created or revenue increased as a result of academic training offered, company products/processes developed through faculty input, and company revenue increased by institutional workforce development programs—are very difficult to capture in the short term. A metrics framework should involve a holistic approach to assessing both direct and indirect impact on the institution's regional ecosystem, as well as taking into account internal and external performance. Correctly designed metrics can improve the quality of stakeholder interaction, identify risks, inform program development, and guide research and productivity. Consultation with a central office of institutional effectiveness/research can assist with structuring the collection and analysis of data. For example, metrics proposed in the AUTM IEE index include:

- Institutional entrepreneurship and economic development (e.g., the institution has clearly identified mechanisms on the front page of its website for engaging with the institution).
- Ecosystem of the institution (e.g., mechanisms for connecting professionals active in the area to entrepreneurial activities).
- Human transfer (e.g., number of students and companies engaged in "capstone" or other experiential-learning opportunities).
- Transfer of technological knowledge (e.g., number of faculty involved in consulting, research, or other types of knowledge transfer involving the community).
- Network creation (e.g., community-engagement events held by the institution designed to increase economic interactions).
- Value creation (e.g., licensing income or research income by source— federal, industrial, other).

Conclusion

While there are many issues to consider when engaging in partnership activities, the outcomes can yield a number of positive results for the academic institution, the partnering entity, and regional, national, and international communities. Creating a culture of collaboration, placing the best people in critical positions, and providing support for innovation, entrepreneurship, and economic development are essential to any public-private partnership.

Furthermore, establishing sound policies for intellectual-property ownership and use, for contracts and agreements, and for revenue sharing will aid institutions in advancing knowledge, managing expectations, and navigating legal complexities. Engaging in public-private partnerships is mutually beneficial to students, faculty/staff members, the academic institution, and the external community and contributes to economic growth and prosperity.

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Facilitating Innovation and Technology Transfer

John S. Crockett, Edward T. (Tommy) Martindale,
Kyle Welch and W. Timothy Hushen

Overview

SAN DIEGO STATE UNIVERSITY

University research laboratories are a significant source of innovation and technological advances that not only move science forward through discovery but also serve to fuel economic growth on a global scale. The far-reaching potential impact of translating discoveries originating from university research into technologies and products available to the public includes new drugs, vaccines, and treatments for cancers, diabetes, AIDS, and other debilitating diseases; new life-enhancing products that cut across the entire spectrum of our work life and recreational activities; new-business development and job creation; and other benefits that can improve the quality of life for people worldwide. While excelling in research and discovery, universities in general are not adept at translating their discoveries to the marketplace. Licensing technologies and promoting new start-ups are not inherently part of the academic mission. The challenge is how to overcome the hurdles that impede the technological transfer of these discoveries to serve the public good.

To address this challenge, much attention has been given in recent years to the processes for facilitating innovation. Examples at the federal level include several well-publicized programs, including the i6 Challenge, the Jobs and Innovation Accelerator, the Manufacturing Accelerator, the National Science Foundation I-Corps Sites program, and the Small Business Administration's Regional Innovation Clusters. An emphasis on regional innovation for job and economic growth has received intense academic attention for several decades, perhaps beginning most significantly with Paul Krugman's seminal work in 1991 "Increasing Returns and Economic Geography." He posed the as-yet unanswered question: "Why and when does manufacturing become concentrated in a few regions, leaving others relatively undeveloped?" Practically speaking, the term "manufacturing" can easily be substituted for "innovation" or "economic growth" or many other activities. For any of these activities, however, the fundamental questions of "why," "when," and "how" remain unresolved.

Traditional measures of cluster formation, effectiveness, capacity, and impact on economic growth have only evolved as far as after-the-fact analyses of "what." A common and comprehensive list of the effects of innovation can be accessed through the Economic Development Administration's U.S. Cluster Mapping Project. Forward-thinking practitioners are beginning to move beyond this reductive analysis, however, to ask questions about identifying necessary pre-existing conditions that lead to optimized innovation systems and to ask how those conditions can be intentionally designed.

This chapter will review the case study of San Diego State University's innovation and technology transfer programs; describe challenges, needs and opportunities that allowed these programs to thrive; and explore methods for identifying and creating similar conditions at other institutions around the country.

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The San Diego region is recognized globally as being uniquely capable of cross-disciplinary collaboration to advance emerging technological development and businesses. San Diego has recognized clusters of businesses supporting communication technology and IT (3,000 companies), biotech (600 companies), energy and the environment (800 companies), and defense and security (300 companies), among others (Connect, 2013).

San Diego County is home to the world's largest cluster of wireless businesses and is an emerging hub for pharmaceutical research and development, medical-device and diagnostics start-ups, and an emerging cluster of cyber-security industries. These companies fuel the creation of high-paying jobs that result in an average income in the San Diego region that is nine-percent higher than the overall U.S. average. In addition, the science and technology industry in the San Diego region is expected to add more than 125,000 jobs to the local economy (Biocom, 2012). Research institutions and other entities receive combined federal research funding exceeding $5 billion per year and collectively generate discoveries that are the basis for the continuous generation and development of innovative products and services. Over all, the San Diego region is an ideal center for discovery, collaboration, acceleration, and convergence for new and existing technology-based growth companies.

CONNECT, a regional not-for-profit trade organization and charitable foundation, supports sophisticated tracking of San Diego's innovation ecosystem through publication of the *San Diego Innovation Assets Report.* Recent highlights include:

- 150+ locally developed innovative new products launched in 2013.
- 80+ local research institutes and organizations.
- 70+ venture-capital investment entities with a local presence.
- 5 local organizations of "angel investors"—wealthy individuals who invest in promising businesses in their start-up phase.
- 15+ incubators, accelerators, and "co-working" environments.
- 20+ local trade organizations directly supporting San Diego's innovation economy.
- 40+ STEM (science, technology, engineering, and mathematics) education programs in the San Diego region and links to additional resources.
- maps of companies comprising San Diego's technology clusters; and
- 5+ existing cluster initiatives.

As the list above indicates San Diego is home to more than 80 research institutions, many of which are clustered on the Torrey Pines Mesa in La Jolla. As also noted, this concentration of top research talent attracts billions of dollars each year in federal and state research support, which fosters technological discovery, facilitates early-stage technology start-ups, and propels pathways to commercialization. The five major clusters of innovation are nurtured by physical proximity to universities and research institutes.

How SDSU Became a Leader in Local Innovation

With the right blend of university curricula and industry involvement, San Diego State University (SDSU) has emerged as an entrepreneurial leader. The *U.S. News & World Report-Top 25 Graduate Schools for Entrepreneurs* has rated the SDSU Entrepreneurship program among the best in the country. In addition, Forbes magazine in 2014 ranked SDSU as No. 18 on its list of "America's Most Entrepreneurial Research Universities." SDSU has become a stellar example of what can result when academic talent, local industry, and private donors join forces, balancing the very latest academic knowledge with hands-on experience.

The elements needed to fuel economic development are abundant in San Diego County. For example, San Diego is home to world-class research and teaching universities, including San Diego State University, the University of California, San Diego, and the University of San Diego. The county is also home to private research institutes including the Sanford-Burnham Medical Research Institute, the Salk and Scripps Research Institutes, and SPAWAR Systems Center Pacific—the U.S. Navy's premier research laboratory. In addition, the region also has a number of established venture-capital networks, supportive local and regional governments, and strong regional economic-development corporations and industry associations.

SDSU's Internal Infrastructure and How it Drives Innovation

Anchored by projects managed by the office of the vice president for research, new technological innovations have been forged and new companies led by young entrepreneurs created that support the commercialization of these technologies. In addition, programs have been leveraged to secure new federal sponsors, such as the Small Business Administration, to facilitate economic recovery and growth through creation of new jobs, companies, and markets.

The Research Advancement Group. The Research Advancement Division initiates and manages a diverse portfolio of research and educational-development initiatives. Working closely with numerous faculty members and research centers at the university, the division fosters several major multidisciplinary, interdisciplinary, and multi-institutional research programs. In addition, the division provides technology transfer services to SDSU that include protection of intellectual property and commercialization of faculty inventions. The division also provides management assistance for complex multi-institutional research and educational programs, which often include collaborative partnerships with private industry, government organizations, and other academic institutions. Under the guidance of the VP for research, the unit invests in research initiatives, promotes SDSU research among various sponsors, and provides services that ensure SDSU follows the highest ethical standards in its research.

To understand the roles, responsibilities, and flexibility that SDSU applies to the issues of innovation and commercialization, it is necessary to understand the university's organizational structure. SDSU's research and grants and contracts

efforts are managed and facilitated by a separate 501(c)(3) non-profit auxiliary—the San Diego State University Research Foundation (SDSURF). Although the foundation was established in 1943, it took on its principal role of managing grants and contracts in response to the California Master Plan for Higher Education of 1960. This legislative plan essentially designated the University of California system as the home for graduate education and research, and the California State University system as the home for undergraduate education. Obviously, both systems had capacity then, and have built capacity since, for a broad suite of core academic missions and the full range of educational experiences. To avoid having the university systems directly compete for research funding, the CSU auxiliaries, of which SDSURF is one, were established and are authorized by the universities to act as the recipients and to manage all grants and contracts.

Its status as an auxiliary organization creates opportunities for the SDSURF to implement policies and practices that are dynamic, responsive, and creative. An example of the flexibility offered by the foundation to support SDSU's innovation efforts is the SPARK (Sports, Play & Active Recreation for Kids) program. Inspired by NIH-funded research that began in the 1980s, SPARK is an evidence-based, public-health organization that has developed empirically based physical activity and nutrition programs that provide curricula, staff development, follow-up support, and equipment to educators teaching K-12 students. In the initial phase of the program, SDSURF administered the program until it reached a critical mass, at which time it was licensed to a national provider of educational materials. Since 1989, SPARK has trained teachers at more than 100,000 schools worldwide, and its programs impact thousands of students each year. Currently, SPARK has a several million dollar annual product line.

While all other divisions of SDSURF report to the executive director of the research foundation, the Division of Research Advancement reports to SDSU's vice president for research. This organizational bifurcation represents a recent innovation and a campus-wide recognition of the importance and value of research advancement in supporting campus innovation, innovation-based programs, and the university's role in regional economic growth. For example, the division, under the direction of the VP for research, played a critical role in contributing to the articulation of two core elements of the SDSU Strategic Plan—research and creative endeavors and community engagement. As part of this process, the following initiatives have been

codified as part of SDSU's strategic plan to contribute to the advancement of the San Diego region:

- Creation of the "Industry Affiliates Partnership" program to advance support for the commercialization of products and services.
- Investment of funds to strengthen SDSU's culture of entrepreneurship and innovation.

While the division performs a wide range of duties, those most relevant to facilitating innovation are:

- Developing and implementing an outreach and education program for faculty and staff regarding intellectual property (IP) and the university's technology transfer program.
- Assisting inventors and authors with the preparation of IP disclosures, declarations, royalty distributions, and other documents concerning technology transfer.
- Evaluating faculty/staff work products to determine patentability and commercial viability, presenting disclosures to the University Copyrights and Patents Committee, and developing a strategy to execute technology transfer.
- Assisting inventors and faculty in identifying funding opportunities for further research and product development, and assisting in the preparation of grant proposals.
- Overseeing patenting/copyrighting, marketing, and licensing activities to facilitate commercialization and generation of additional research funding, including selection of an IP attorney.
- Providing support for negotiation of confidentiality, material transfer, Cooperative Research and Development Agreements (CRADA), and licensing agreements with industry and other organizations.

SDSURF's Technology Transfer Philosophy: Driving Innovation with Creative Deal Structures. Inflexible licensing terms and practices can cause potential licensees to lose interest. Such practices ultimately burden or halt commercialization and create a negative perception of technology transfer. A traditional licensing deal requires an exclusive licensee to pay an up-front license fee, costs for intellectual-property protection, and a running royalty. However, such a model frequently stands in the way of innovation rather than facilitating it. Frequently, a potential licensee may need to perform further evaluation to

determine whether to commit its resources to a licensing agreement. In other cases, a potential licensee may be unable to pay an up-front licensing fee because the technology requires significant investment before it is ready or market. Here we examine some of the tactics and programs SDSU uses to overcome these issues.

Technologies disclosed to the university's technology transfer office (TTO) are generally at an early stage of development and require significant additional development and testing before they can be taken to market. At this stage, it is unlikely that a licensee would be willing to pay a large up-front licensing fee and commit to on-going royalties. To drive the development of such technologies and allow potential licensees to further determine their feasibility, the TTO frequently offers an exclusive option to license the technology for a defined period of evaluation. The University of Minnesota recently coined the term "try and buy" for similar transactions. In exchange for a nominal option fee and for covering the on-going patent costs, a potential industry partner can evaluate a SDSU technology without the fear that the technology will be licensed to another party during the prescribed period. After the evaluation is complete, the pending licensee/potential partner can determine whether it wishes to pursue an exclusive license. The parties typically have pre-negotiated many terms of the license ahead of time, which simplifies the next step if the potential licensee is satisfied with its evaluation.

Another reason that the TTO may deviate from the traditional exclusive-license structure is that the licensee may simply be unable to pay an up-front license fee. This is a common problem when significant investment for further development is necessary before the technology in question is market-ready or in the case of a start-up with limited funding. In these instances, the TTO can often accommodate the licensee by deferring the expense of license fees until particular milestones are met. This strategy allows development efforts to go forward on technologies that might otherwise be un-licensable. Triggers for milestone payments may include obtaining equity financing above a particular amount, initiation of a particular phase of clinical trial, product launch, acquisition, or valuation above a particular dollar amount.

While there is a risk that no licensing fees ultimately will be paid, the initial licensing fees are generally substituted for significantly larger payments when the

milestones are achieved. Furthermore, the fees would often unnecessarily burden a start-up and prevent further investment in development of the technology. Creative structures for deals should certainly be evaluated on a case-by-case basis, depending on many factors. However, the more flexible terms we described are often excellent tools for preventing what would otherwise be an impasse.

SDSU's Entrepreneurial/Innovation and Partnership Efforts

San Diego State University's robust spirit of entrepreneurship and innovation has fostered the development of several SDSU centers that promote innovation and entrepreneurship both within the university and in partnership with regional and national organizations. With the right blend of university curricula and industry involvement, the Lavin Entrepreneurship Center in the university's College of Business Administration has emerged as an entrepreneurial leader.

The Lavin Center has become a stellar example of what can result when academic talent, local industry, and private donors join forces, balancing the very latest in academic knowledge with hands-on experience. The university's innovative learning environment and San Diego's exciting entrepreneurial business climate have been brought together through a dynamic curriculum, support from local industry leaders and philanthropy to establish a leading entrepreneurship program. One of the premier programs is the Center for Commercialization of Advanced Technology (CCAT), which has served as a model for the development of a series of highly successful programs aiding small-business development, economic recovery, and entrepreneurism in California.

CCAT was created in 1999 to provide a cost-effective and comprehensive approach to commercializing technological advances from academia, industry, government, and individual entrepreneurs to meet real-world problems of national importance. With the leadership of the Lavin Entrepreneurship Center, a team of San Diego-based entrepreneurs, university researchers, business executives, and government technology transfer experts recognized that the Department of Defense (DoD) needed support in crisis/consequence management and other critical national defense areas. It was recognized that the department was unable to take full advantage of the innovative spirit and talents of U.S.-based technologists and that this problem was particularly evident among small businesses.

The team developed a new approach that would improve on traditional methods of technology transfer employed by government laboratories and academic research institutes, which have had limited success in the transfer of government-developed and/or funded technologies to the commercial marketplace as mandated by the Stevenson-Wydler Technology Innovation Act of 1980. In response, the Defense Advanced Research Projects Agency (DARPA) supported a pilot program that created a new model for technology transfer and commercialization using faculty-student teams from the College of Business Administration and the MBA program. These teams performed market research to determine the market viability of a new technology and facilitated license agreements with existing companies or new start-ups. The success of the pilot subsequently led to the more comprehensive CCAT program.

The primary goal of CCAT was to accelerate the time to market for technologies residing in government laboratories, universities, and private companies—particularly in small but innovative companies lacking the resources and expertise to commercialize cutting-edge technologies. Taking the traditional idea of technology transfer and expanding it into a multi-faceted, market-driven approach that leverages the unique and diverse capabilities of industry, academia, and government, the program's founders were able to attract Congressional interest, resulting in funding for the CCAT program. This funding began in July 2001 and resulted in the expansion of CCAT to support a variety of federal agencies through competitive awards. With the attack on 9/11, the program was expanded further to address priority needs in homeland security as well as homeland defense.

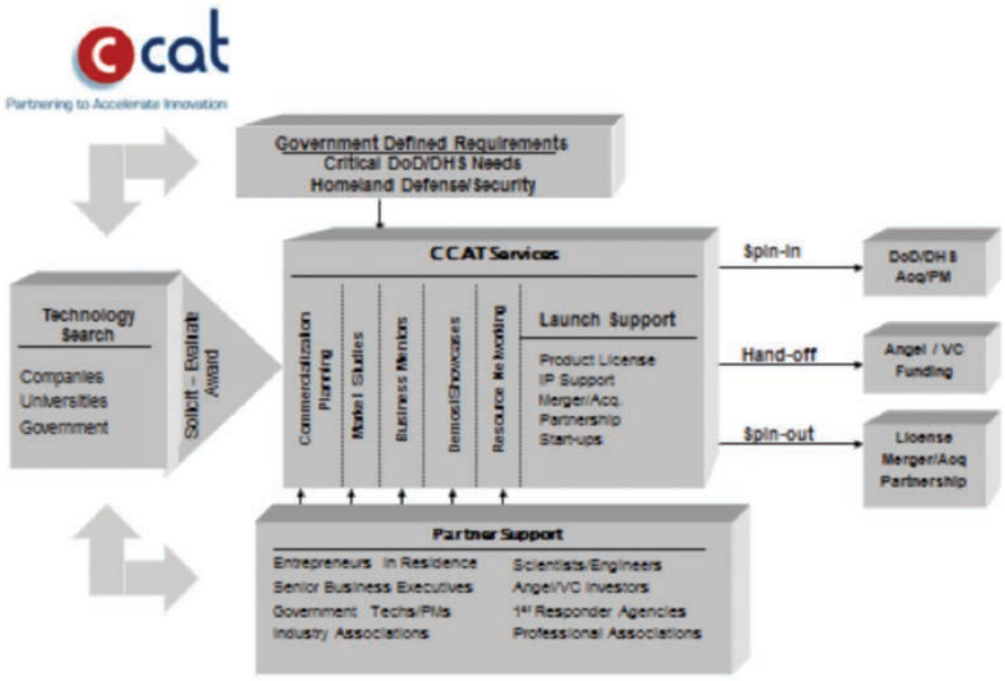
Although the focus of the original program was on addressing DoD requirements, the CCAT program expanded its focus to address the underlying problem with technology commercialization, to meet the needs of other government agencies as well as the commercial sector, specifically small businesses. CCAT worked with organizations and companies nationwide to address issues of energy and national security, environmental health, and first-responder requirements in dealing with man-made and natural disasters. CCAT also served to stimulate economic development and recovery as it promoted transfer of university-sponsored technologies to the marketplace and supported new company start-ups.

The SDSU commercialization model, as embodied by CCAT and others, uses two primary principles to drive effective research, development, demonstration, and

deployment. These principles are definition of market-driven needs and business planning undertaken simultaneously with technical development.

The CCAT Process, depicted in the graphic below, is a multi-phased, fully integrated process designed to facilitate the rapid transition of technologies to the marketplace. The process includes three phases, with each having one or more key activities. Phase 1 consists of: (1) the definition of requirements and (2) the solicitation, evaluation, and award of services. Phase 2 includes: (1) execution of awards for development of technological products and (2) conduct of supporting services for market and business development. Phase 3 is an "after action" activity that involves promoting marketing through conducting additional first-responder testing and evaluation, networking with investors, facilitating licensing/partnership agreements, etc. This phase also includes capturing success metrics and lessons learned for use in providing timely follow-on support to the companies, as well as improving the overall process for future CCAT program operations.

The CCAT Process



Source: SDSU's Center for Commercialization of Advanced Technology (CCAT).

Definition of Needs. SDSU's innovation and commercialization programs typically use one of two techniques for needs assessments. One process requires full development of an experienced team to completely evaluate the mission and objectives of a potential decision-maker. The second, the Quick-Start Needs Assessment, utilizes a similarly experienced team to evaluate and validate self-reported needs, with additional data collection and interpretation focused on opportunity costs and return-on-investment of identified needs. The appropriate needs assessment is customized to the goals of the sponsoring organization. For example, working closely with DoD representatives, a set of government-defined priority requirements is developed for a nationwide solicitation of technologies and the criteria to be used in selecting potential technologies for the commercialization project. These requirements will be based on information defining the needs of first responders, for which DoD may have invested research and development funds. In particular, the CCAT team might use the "Project Responder 3: Toward the First Responder of the Future" report, issued in March 2012 by the Department of Homeland Security's Science & Technology Directorate, as a basis for determining first responders' priority needs.

Project Identification and Selection. Under the requirements of the needs assessment, a focused solicitation for solutions can be broadcast to targeted respondents. If the needs involve disparate industries, multiple solicitations can be managed. The existing infrastructure and experience of the SDSU team insure that all solicitations are managed extremely economically and efficiently using modern electronic filing and secure-server technologies. In some cases, existing databases can be used to identify target projects or technologies owned by companies, for example through databases of the Small Business Innovation Research program (SBIR) or codes used by the North American Industry Classification System (NAICS) for the particular technological field of interest.

Technical Evaluation. The objective of this activity is to review, evaluate, and select technological applications that meet the solicitation criteria and offer viable solutions addressing one or more of the designated requirements. The evaluation process is multi-staged and designed to be completed in 45 days or less from closure of the solicitation. Each application is evaluated based on a scoring system designed to ascertain the technology's potential for accelerated transition into the marketplace. The existing CCAT and Partner databases of

more than 150 independent subject-matter experts, including entrepreneurs, engineers, government technologists, academic researchers, marketing experts, intellectual-property attorneys, and venture/angel investors, will be dedicated to this evaluation. The CCAT program commonly uses subject-matter experts with a variety of backgrounds to insure maximum quality in the initial review.

Panel Review. Representatives of relevant companies often are required to present their solution in person to a panel of experts drawn from the established network of public/private/academic collaborators. The make-up of the panel is part of the critical innovation offered by the SDSU model. By drawing from multiple areas of expertise (technical, commercial, and public), the potential performance and value of any proposed solution can be more fully evaluated, and investment opportunities either for new technology or for a retrofitted design can be more completely modified to minimize risks. In-person presentations to the review panels have proven indispensable in identifying which groups have the ability to deliver a commercially viable product. Evaluations of the panel sessions focus on assessing the marketability of the technology and the viability of the applicant's commercialization strategy, resources, and business capabilities/ experience.

Recommendations. Recommendations for investment are subsequently scored in a similar manner. However, investment recommendations from the panel are not required, nor do they always follow the ranked scores. When recommendations are made, all factors are reconsidered, including the original findings of the needs assessment regarding opportunity costs and return-on-investment. In addition to selecting the most viable technologies that address one or more of the priority requirements, a customized set of services and awards is designed to facilitate a successful transition to market.

Simultaneous Business Planning and Technical Development

Multiple years of execution have allowed the SDSURF commercialization team to develop a series of management strategies and documentation, which streamline activities that range from team-building to direct funding. These processes can be modified to meet the needs of specific projects, but in general they hold all participants in the programs to a high level of performance without impeding progress with superfluous administrative requirements. The focus is on adapting

the technology to the targeted use, conducting in situ tests and demonstrations to validate utility, and concurrently mitigating business, market, and other risks.

Parallel Services

Although additional funding is often a critical need for advancing technologies into the commercial environment, funding alone is not sufficient for success. Potential technical solutions frequently languish due to poor visibility, poor leadership, or lack of a go-to-market strategy. To address these particular hurdles, the CCAT commercialization program has established a suite of services that can be provided in concert with direct funding, thus greatly enhancing the prospects for success and ensuring return-on-investment. It includes:

- Intellectual property support (risk assessments, protection, licensing)
- Market development aid (market assessments and planning)
  - Market-feasibility assessments
  - Market analyses
  - Market validation
- Business development and transition assistance (planning, investors, funding)
  - Transition planning
  - Investment networking
  - Partnerships/licenses
  - Business mentoring
- Funding for technology development (grants, contracts, sponsorships)
- Recommendations (limitations, decisions on whether to go forward)
  - Training
  - Surveys
  - Advisory committees

This approach to technology commercialization leverages existing experience in improving investment decisions regarding developing particular technology. It is a streamlined, modular tool that can be quickly and effectively deployed to support program managers and other decision-makers in reducing the risk when evaluating new projects, technologies, designs, and implementations. This process is differentiated from other RFP processes by being completely turn-key, modular, applicable to multiple sites, objective, rapid, extremely cost-effective, and proven in a variety of applications over 10 years.

Zahn Innovation Center

The Zahn Innovation Center is a commercial and social incubator that supports San Diego State University innovators and aspiring entrepreneurs—students, faculty members, and staff from any major or department on campus—as they transform their ideas into companies. It helps such individuals work in teams in a collaborative environment to launch companies in fields ranging from 3D-printing to biofuels. Upon admission to the center, each team gains access to collaborative working spaces within the College of Engineering. Business acumen is provided courtesy of the incubator in conjunction with the College of Business Administration and the Lavin Entrepreneurship Center. Each team also gains access to engineering services, mentors, domain experts, and pro bono legal guidance. The team also receives introductions to potential investors and to a variety of community connections involved in developing new products, launching new businesses, and creating new jobs in the community.

The center's top priority is to support growth of start-up companies formed around ideas generated by SDSU students, faculty, and staff, and to do so in a way that provides valuable and rewarding experiences to those who participate in the process. At the same time, the center seeks to help establish actual companies and create new jobs in the community as a result of this process. The center works closely with the technology transfer office to align resources available to faculty entrepreneurs seeking to commercialize SDSU-owned intellectual property.

The Zahn Innovation Center was established with a gift of $725,000 from Irwin Zahn and the Moxie Foundation and an additional gift of $150,000 from the Kerr Family Foundation. The center opened in March 2012 inside SDSU's industrial technology building and now is home to multiple start-up teams. The center received a second gift from the Moxie Foundation in summer of 2013 that allowed it to add the support of social enterprises to its existing menu of commercial enterprises, thus assisting in the development of projects resulting in a social impact. Through supporting teams working on projects, the center provides opportunities to create positive and significant social impacts on the San Diego community and beyond. Now approaching its third anniversary, the center has had a rapid impact on the entrepreneurial growth on campus and in the local community. The center has supported at least 43 teams and has launched seven new businesses.

Important University Partners and Innovation Resources

Besides the Zahn and Lavin centers, on-campus resources to support innovation at SDSU also include the NSF I-Corps Biotechnology Site Program and links with the CONNECT and Tech Coast Angels organizations, described below. Finally, SDSU provides many specialized, federally funded programs tailored toward the commercialization of specific technologies related to defense and energy companies.

CONNECT. A globally recognized non-profit organization fostering entrepreneurship in the San Diego region, CONNECT is known for catalyzing, accelerating, and supporting the growth of the most promising technology and life-science businesses. It provides links to the investment community and delivers targeted, high-level expertise to facilitate business growth and development through the sponsorship of events and consulting/networking services. SDSU has developed a strong working relationship with CONNECT and takes full advantage of the resources it makes available. In addition to serving on the CCAT Board of Directors, CONNECT's vice president of business creation and development sits on SDSU's University Copyrights and Patents Committee, which allows the process of match-making with potential Entrepreneurs in Residence (EIR) or local industry partners to occur at the earliest possible juncture. The EIRs are community volunteers with senior or C-level management experience in building companies, raising capital and bringing technology products to market. The EIRs provide mentoring and guidance to emerging tech and life sciences companies through an extensive coaching process to help the entrepreneur develop a compelling commercialization strategy and value proposition, refine their investor approach, and build their management team. Additionally, CONNECT works with SDSU to organize Springboard, a business acceleration program designed to assist science and technology-based start-ups with strategic business, marketing, and financial guidance. Springboard's intake sessions match faculty members and mentors (EIRs) with experience building a successful company and appropriate technical backgrounds.

The CONNECT EIR program has grown to 500 volunteer mentors who are primarily experienced entrepreneurs or executives. Of the 412 new companies created in San Diego in 2013, 215 had been applicants to CONNECT programs The success of the Springboard program has had an extraordinary impact on the San

Diego region. As of December 2013, 267 Springboard companies were actively in business, a 67-percent survival rate. Furthermore, CONNECT-affiliated companies raised almost $150 million in 2013 alone.

Over the past few years several SDSU faculty entrepreneurs have participated in CONNECT's programs, and most have made positive strides toward commercialization based on the feedback received from their CONNECT mentors. One success story in particular demonstrates the power of the resources available through CONNECT's programs. Mark Sussman showcased his engineered stem cells for rebuilding damaged heart tissue at a Springboard intake session, and the mentors he was assigned joined and funded the company, CardioCreate, which is now on track to begin Phase I and II clinical trials, important steps toward taking this life-saving technology to market.

Tech Coast Angels. A strong collaborator with SDSU and CONNECT, Tech Coast Angels ("TCA") is an "angel investor" network in the United States and one of the leading sources of funding for early-stage companies in Southern California. Since its inception in 1997, TCA members have focused on building valuable companies, personally invested nearly $119 million, and helped companies attract more than $1.4 billion in additional capital, mostly from venture capital firms. Besides capital, TCA members provide counsel, mentoring, and access to an extensive network of potential investors, customers, strategic partners and management talent. TCA has more than 250 members, including its venture capital affiliates, in five networks in Los Angeles, Orange County, San Diego, Westlake/Santa Barbara, and the Inland Empire (Riverside-San Bernardino-Ontario metropolitan area). SDSU has licensed products to TCA members and a TCA vice president has served on the CCAT advisory board and has provided numerous mentors and client managers for the commercialization program.

Benefits of External Development

Entrepreneurial training and early evaluation of the commercialization possibilities of university research can have ancillary benefits:

- A research or technology-development plan can be mapped in collaboration with a potential commercial user, which helps make the experiments, data,

and development pathway commercially relevant. For example, academic combinatorial chemists and commercial drug-design scientists typically don't even read the same journals. Therefore, academically produced data on efficacy and toxicity is of limited commercial value. Early evaluation and collaboration can correct this.

- Early engagement of strategic partners can lead to cash or in-kind contributions of research resources in exchange for previews of novel data. These external relationships also often facilitate the formation of partnerships and initial staffing of start-up companies with experienced business professionals.

- Entrepreneurial training helps in the initial go/no-go decision regarding patenting, as well as in making decisions on when, where, how, and on what to apply limited resources.

Entrepreneurial Training and Curricula

The landscape for academic research funding is becoming increasingly competitive. Any advantage faculty members can acquire increases their likelihood of securing and executing innovative research programs to the benefit of their labs, departments, and university. Faculty members who have the ability to approach research with commercial intent may have advantages in securing funding from sources other than the traditional federal programs, and they may have greater success in translating their discoveries into useful products. Entrepreneurs must learn how to present their ideas to decision makers who are capable of providing resources for a new business venture.

SDSU has hosted an internationally recognized intercollegiate business-plan competition (Venture Challenge®) for the past 20 years. Venture Challenge® is a part of the national network of such competitions, which support the development of new ventures, many of which are based on commercializing technologies developed at their universities. Entrepreneurial curricula must include support for students to explore the commercialization of technologies through coursework and internal competitions, along with mentoring and coaching. With additional resources, we can create new models for these competitions to drive curricula that infuse entrepreneurship, innovation, and commercialization across the disciplines.

Student training, particularly that of graduate students in technical fields, can have a "managing-up" effect in research laboratories and expose faculty members to entrepreneurial concepts, efforts, and values that can have cumulative effects in accelerating the translation of research products to commercial ventures.

National and Regional Programs Guide University-Industrial Innovation

San Diego State has a series of programs to enhance innovation and to "fast track" discoveries from the laboratory/garage/small business into commercially viable products. Examples of the programs follow.

NSF I-Corps Program. In May 2014 the California State University (CSU) Program for Education and Research in Biotechnology (CSUPERB) received a three-year grant from the National Science Foundation's Innovation Corps (I-Corps) Sites Program to provide entrepreneurship education for CSU students and faculty. Through the program, microgrants are awarded to teams comprised of students and faculty researchers to enable them to develop commercialization strategies and navigate the complex bioscience market. The microgrant recipients are trained and advised by commercialization experts and industry professionals for six months. Some successful teams then become eligible for follow-up funding from the sites program to further develop new products, services, and processes for the bioscience market.

The purpose of an I-Corps site is to nurture and support multiple local teams to transition their ideas, devices, processes, or other intellectual activities into the marketplace. Mandatory participation in a series of regularly scheduled webinars that are designed to teach participants about customers, business models, business communications, regulatory affairs, and other concepts in biological-sciences commercialization. These concepts include: (1) developing a concept for a biotechnology product, service, or process by working with mentors and advisors drawn from CSUPERB's statewide network of biotechnology industry associations, alumni, and campus-based innovation centers; (2) assessing their biotechnology idea's maturity, venture feasibility, and follow-on funding strategies based on feedback from customers and advisors; and (3) presenting the final venture concept at a CSUPERB event identified in individual award letters.

Regional Innovation Clusters (RIC). The objective of the San Diego Regional Innovation Cluster (SDRIC) is to provide business-development support and services such as training, mentoring, consulting, networking, and other support to help small businesses develop, produce, and fast-track commercialization of technologies, systems, and services to both the government and commercial marketplaces. In particular, the SDRIC works closely with individuals and teams of small businesses in the following areas: (1) ascertaining the technological development requirements and priorities of federal agencies such as the Departments of Defense, Energy, and Homeland Security, among others, and then matching and operationalizing the cluster's technology and capabilities to best meet these needs; and (2) developing areas with high-growth potential within these departments and agencies. The areas include advanced electronics, robotics, defense systems, power/energy innovations, cyber-security, and other appropriate high-tech markets. An equally important objective is the resulting economic growth and sustainability of the San Diego region and its high-tech industry clusters, a byproduct of helping small companies develop and commercialize their products and services in these and other markets.

California Energy Commission's Energy Innovations Small Grant Program (EISG). The California Energy Commission has designated the SDSU Research Foundation as the program manager of its Energy Innovations Small Grant Program. The EISG provides up to $95,000 to small businesses, non-profits, individuals, and academic research organizations to conduct studies that establish the feasibility of new and innovative energy concepts. The program provides critical business, marketing, and funding advice to promote the advancement of new technologies to the energy consumer and energy providers. The program has resulted in the formation of new companies, attraction of additional public and private funding to the companies, mergers and acquisitions, and energy innovations that benefit the ratepayers and energy providers.

U.S. Department of Energy's Energy Innovation Ecosystem Development Initiative. SDSU is working in partnership with the University of California San Diego's von Liebig Center and Rady School of Management on this initiative. The effort is aimed at accelerating the commercialization of university-developed, cutting-edge technologies for energy efficiency and renewable energy. Under this $1.05 million grant the partnership will strengthen the San Diego region's

innovation pipeline and address inefficiencies in translation of university research discoveries to the private sector.

The program will hold a series of events called Regional Energy Innovation Challenges and will provide fellowships plus extensive mentoring for the most promising technologies. Teams of innovators, comprised of experienced advisors, faculty members, science and engineering students, and MBA students will collaborate to develop commercialization plans. A virtual network will connect innovators, business students, entrepreneurs, and sources of capital to each other and to other initiatives involving clean energy on campus, in the region, and worldwide.

The innovation-ecosystem projects will be led by universities or nonprofits based in five states and will include universities, businesses, government agencies, research institutes, economic-development organizations, business accelerators, and national laboratories. The grant recipients were selected based on one or more of the following objectives: nurturing and mentoring of entrepreneurs; pursuit of intellectual-property protection for technological innovations; engagement with the surrounding business and venture-capital community; or integration of sustainable entrepreneurship and innovation across university schools and departments.

Economic Development Agency, Employment Training Administration, U.S. Small Business Administration (Jobs Accelerator and Innovation Challenge). This project offers a special opportunity to leverage a combination of experience, academic integrity, research facilities, and natural resources to exert a global impact on development, demonstration, deployment, and workforce training for renewable-energy technologies. By taking advantage of the existing SDSU Brawley Campus, located 110 miles east of San Diego in the Imperial Valley, and enthusiastic administrative and regional support, we will establish a relevant physical site to perform commercial-scale proof-of-concept demonstrations, supported by multi-faceted commercialization support and targeted technical-training curricula to create high-wage jobs.

By focusing the efforts on Imperial Valley, the economic outlook of one of the most economically distressed regions on the country will substantially improve. In April 2011, unemployment in Imperial County was 27.9 percent, the highest in the

country for any area with at least 50,000 people. The strategic plan of SDSU and our partners is comprised of a multi-pronged approach that recognizes and attacks obstacles to the widespread adoption of renewable-generation technologies. Including technical, economic, and education/training goals, the project's multi-disciplinary approach makes this proposal ideally suited to the multi-departmental funding in this program.

Defense-Oriented Development Initiatives

SDSU has a history of working closely with Department of Defense agencies. Since the region is home to a number of military installations, SDSU is ideally suited to support these initiatives.

Defense Preparedness Support Initiative (DPSI). Working closely with representatives of the Office of the Secretary of Defense , SDSU's Center for Commercialization of Advanced Technology (CCAT) defines a set of priority military and first-responder capabilities and technology gaps, conducts national solicitations for technology solutions, facilitates operational tests and evaluations for selected technologies, and provides business and market-development services to facilitate the transition of viable technologies to the defense and first-responder marketplace.

Naval Explosive Ordnance Disposal Technical Division (NETD). At the request of this division, CCAT conducted a rapid solicitation to identify technologies to improve the utilization of robotics in Afghanistan and Iraq to more safely and efficiently disarm improvised explosive devices (IEDs). Within six months CCAT helped a small company develop and demonstrate a remote tool changer for use on commercial robots.

U.S. Army's Rapid Equipping Force (REF). Working closely with REF representatives, the CCAT team conducted a pilot program to identify near-term energy solutions for use by the U.S. Army's rapid equipping forces. CCAT helped define a set of technological gaps and priority military requirements, conducted a nationwide solicitation for technology solutions, selected two small businesses having innovative technologies, coordinated operational tests and evaluations with military forces, and facilitated the transition of one of the technologies to the operating forces for further development, testing, and evaluation.

DoD/SBO-Studies (Mentor Protégé). At the request of the DoD's Small Business Office, SDSU received funding to conduct independent assessments of the agency's Mentor-Protégé Program (MPP) and the Small Business Technology Transfer (STTR) programs. For Mentor-Protégé, SDSU's study identified areas for standardization and simplification of the program across all services and agencies to increase administrative effectiveness. In the case of the Small Business Technology Transfer program, the objective was to define a concept of operations and to implement a pilot program that would allow new entrants to meet critical defense capabilities while utilizing commercialization processes located at higher-education institutions. Both studies provide detailed recommendations.

SDSU's Signs of Success

SDSU's aggressive entrepreneurial and innovation programs, under the guidance of the VP for research, have allowed the university to be extremely competitive in securing federal and state funding to support multiple innovation and commercialization programs benefiting San Diego and the nation. The following summary illustrates some successes of the programs competitively awarded to SDSU:

The CCAT program has achieved the following:

- 58 nationwide competitive solicitations were conducted seeking advanced technologies for military and homeland defense, with over 1,400 proposals received, mostly from small businesses.
- 240 technologies received over $51.4 million in commercialization support, including 230 grants and 194 marketing-business development plans with concurrent consulting services.
- A 47.8-percent success rate was achieved, with 109 of 228 clients reaching one or more significant commercialization milestones, including sales of technology products, third-party funding, licenses, new company start-ups, and acquisitions/mergers/partnerships within 24 months of completing CCAT services.

Regarding the latter point, examples include such achievements as:

- 48 technologies advanced to the defense/commercial marketplace with $78.8 million in sales.

- 77 companies received $222 million in third-party funding for further technological and business development.
- 22 technology licensing agreements were completed, with nine new start-up companies formed.
- 23 mergers and acquisitions valued at over $91.7 million were achieved.
- The Office of Naval Research and the U.S. Navy's SPAWAR Systems Center Pacific sponsored technology transfer-activities for robotics, energy conservation, energy innovation, chemical and biological warfare, and other DoD laboratory-developed technologies.
- The Office of Assistant Secretary of Defense's Domestic Preparedness Support Initiative (DoD Technologies for First Responders) successfully facilitated the transfer of 13 DoD funded technologies for use by first responders. These ranged from new testing equipment for biological agents and advanced life-saving equipment for life guards to special training programs for law enforcement, emergency medical personnel, and other first responders.
- Department of Homeland Security'sTechSolutions (New Technologies for First Responders) sponsorship resulted in the commercialization of 14 critically needed technologies. These ranged from very low-light cameras for surveillance and stand-alone modifications to existing radios to enhance interoperability, to specialized training programs for first responders and advanced software/law enforcement operations.

The Small Business Administration-sponsored San Diego Regional Innovations Cluster and the Teaming Pilot Program initiatives achieved the following:

- Enrolled 45 local companies to receive customized business-development services, with an emphasis on teaming, proposal development, and other services to facilitate company growth.
- Supported formation of 31 teams of two to six small businesses and the preparation of 22 proposals for large procurement contracts of $10 million or more.
- Helped members secure over $10 million of venture funding and over $50 million in federal contracts.

One specific joint success of CCAT and the Lavin Entrepreneurship Center is illustrated by the story of Lumedyne Technologies. The U.S. Navy's SPAWAR Systems Center Pacific turned to CCAT to assist in commercializing a new

ultra-sensitive accelerometer technology developed by Richard Waters, CTO at Lumedyne Technologies. After submitting an application to CCAT for technology transfer services, Waters was awarded funds for a market study, which ultimately provided SPAWAR with a strategy for advancing the technology to the marketplace. Shortly thereafter, Water's colleague Brad Chisum decided to start a company specifically to commercialize the accelerometer technology. The company was first called Omega Sensors and subsequently renamed Lumedyne. After negotiating an exclusive license, the company submitted an application to CCAT and received prototype funding to further advance the development of the technology. Simultaneously, Chisum explored the technology's commercial applications through his MBA coursework at SDSU. Along the way, Chisum and his partners won the grand prize at the 24th annual Global Moot Corp Competition held at the University of Texas at Austin. Chisum's SDSU team beat out teams from UCLA, Berkeley, John Hopkins, Carnegie Mellon, and other top MBA programs around the world to claim the Global Champion prize. To date, Lumedyne has brought to market three product lines and raised over $3.6 million in equity financing.

Our goals and metrics for success are driven by our past successes, which represent return-on-investment (ROI) of approximately $8 for every $1 spent on our commercialization programs, counting third-party investments, sales of technological products, and the value of new strategic-development partnerships.

Successful Examples of Innovation Facilitated Locally and Spread Nationally

SDSU's infrastructure, devotion to entrepreneurial activities, and emphasis on innovation have resulted in innumerable regional success stories. Several of these positive outcomes have spread well beyond the campus, benefiting institutions all over the world and disseminating valuable knowledge discovered at SDSU for the public good.

One of the most notable success stories facilitated by SDSU is eCHECKUP TO GO. A multidisciplinary team led by faculty members in SDSU's counseling and psychology department developed this series of personalized, evidence-based, online materials for prevention or intervention in alcohol and marijuana use. What began in 2002 with eCHUG—a software program that assesses risk factors for alcohol dependency—resulted in the eCHECKUP TO GO programs now used by

over 600 universities and colleges in 49 states, as well as in Canada, Australia, and Ireland. Several peer-reviewed studies have documented the effectiveness of the training in reducing the levels of dangerous and destructive drinking on college campuses. The program primarily focuses on two high-risk groups: first-year students and athletes. In addition to reducing alcohol use, a side benefit has been an increase in college retention rates and GPAs.

Additionally, SDSU has initiated growth and awareness of technology transfer within the CSU system. Representatives of SDSU's technology transfer office have served on the CSU Committee on Intellectual Property to advise on practices that will facilitate the movement of innovations from system campuses to the marketplace. On occasion, the SDSU technology transfer office has contracted with other CSU campuses to provide its services. In addition, the office has provided training regarding intellectual property to multiple CSU campuses and continues to be a resource to other CSU campuses and to the CSU Chancellor's Office. Through these activities, SDSU hopes to help expand the support available for commercialization at its sister campuses and to build a collaborative resource network among them.

Strategies for University Leaders

SDSU's collaborative and synergistic programs effectively create a center of excellence for technological transition and commercialization that leverages the experience of academic experts, the recognized entrepreneurial spirit and success of the San Diego region, and the opportunities provided by focusing these services at an academic institution with a strong business school and nationally recognized centers for innovation and entrepreneurship.

Given our experience and perspective, we advocate the following strategies:

- Support improved proof-of-concept centers.
- Develop and deploy additional educational curricula and training that integrate commercialization and entrepreneurship with academia.
- Support on-going and new public-policy approaches that make private capital available for early-stage technology-based companies.

Conclusion

SDSU's long and successful experience working closely with industry has contributed to San Diego's becoming one of the major global hubs of the biotechnology, pharmaceutical, and cyber-technology industries. SDSU has trained the largest proportion of the qualified STEM workforce for local industries (including Qualcomm, Cymer, Pfizer, Merk, Eli Lilly, Novartis, GlaxoSmithKline, Bayer, Sony Electronics, and many others). Over the past decade SDSU has become a national leader in the development of new generations of entrepreneurs and cutting-edge technologies to help with homeland security and solve critical national defense needs.

Education has been the catalyst of San Diego's robust science and technology hub. SDSU regularly interacts with industry to evaluate needs and opportunities that will ensure SDSU students receive the type of state-of-the-art training and education required by local companies, thereby producing graduates who can compete for the best jobs and ensuring that its graduates optimally serve local industries. This collaboration has led to several new degree programs that provide graduates with skills needed by industry and that have created economic benefits for industry. The economic impact of the robust science-and-engineering industrial sectors in Southern California provides a clear example of the long-term benefits of investing in higher education, and of higher education investing in the local economy.

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Success Accidentally, On Purpose:

The Portland State University Business Accelerator

Erin Flynn

Overview

This chapter recounts the unlikely story of how an urban-serving university with a modest research portfolio and a nascent technology transfer function created one of the most successful university incubators in the United States in less than a decade. It traces the evolution of the Portland State University (PSU) Business Accelerator and posits that the PSU experience is illustrative of a "bootstrapping" and "partnership" approach to institution-building with important-lessons for regional comprehensive universities—particularly public, urban-serving institutions. Regional comprehensive universities lack the resources or federal expenditures of their wealthier public flagship and private research-intensive counterparts, but they can leverage community connections and deep knowledge of the local economic context to great advantage. Today, the PSU Accelerator is the largest and most successful business accelerator in the state of Oregon. In a ten-year period, companies affiliated with the Accelerator created over 1,100 jobs and obtained $150 million in venture capital and government grants. The chapter concludes with a review of "lessons learned" intended for university leaders who seek to leapfrog traditional approaches to business incubation and entrepreneurship.

Introduction

An exploration of the Portland State University (PSU) Business Accelerator poses a central question: How did PSU—an urban-serving university with a modest research portfolio and nascent tech transfer function—develop a world-class business accelerator? The answer lies in PSU's longstanding collaboration and engagement with key economic development actors in the city of Portland and the surrounding metropolitan region. Put simply, PSU reversed the traditional paradigm for a university accelerator. Rather than pushing technology out of the university, PSU pulled technology and community partners into the institution to

create a dynamic, hybrid model in which the university and the community meet to create unique economic value.

A Non-traditional Route to Success

The vast majority of university accelerators exist to incubate and commercialize faculty research. University innovation rankings are typically based on the number of patents and spin-off companies generated from faculty research. Research-intensive universities like Cal Tech, Carnegie Mellon, MIT, Cornell, Johns Hopkins, and the University of Michigan are routinely cited as top universities for commercializing faculty research. In the past decade, the University of Utah has become a hotbed of technology commercialization and start-up companies, running select university technologies through a 12-week program (the Technology and Venture Commercialization Accelerator) designed to significantly increase the likelihood of start-ups' success. Similarly, through its Venture Lab, Georgia Tech has ascended to become a top U.S. technology incubator, launching hundreds of faculty, staff, and student start-ups.

Without a large research portfolio to draw from, PSU pursued an unconventional route to business incubation. It bought and renovated a 40,000- square-foot building less than a mile from the heart of campus. It offered tech start-ups office space at below market rent and provided easy access to PSU students and faculty. It partnered with the city of Portland to build hard-to-find wet lab space. It opened its doors to the Oregon Health & Science University (OHSU), Oregon's largest research university and only medical school, and it hired savvy and well-connected non-academic administrators to build and deliver programming from its Accelerator aligned with city and state economic development priorities.

While today's PSU Business Accelerator garners local and national attention, its success was far from guaranteed. Portland State is Oregon's largest and most diverse university serving a predominantly local population. The dense, urban campus caters both to transfer students from nearby community colleges and to working professionals. The average age of a PSU student is 27. In 2004 when the Accelerator was established, PSU had virtually no experience in business acceleration, no articulated strategy for the university's role in regional economic development, a modest research budget, and no technology transfer office. PSU's

research expenditures in 2004 were $32.8 million, but they grew steadily over the following decade and now hover around $60 million annually.

The evolution and success of the PSU Business Accelerator can be attributed to an ethos of bootstrapping and partnerships, but it is also a story in which good timing, individuals, and a dash of luck play important roles. The incremental set of moves that grew the Accelerator and its reputation over a 10-year period were not planned or methodical but rather coincided, fortuitously, with a new wave of technology start-ups in the Portland region and a concerted focus on entrepreneurship by city and state policy-makers. Perhaps most importantly, PSU secured talented, dedicated non-academic staff members with deep connections in entrepreneurship and economic development circles to advance a promising but underdeveloped university asset, at precisely the right time.

The PSU model is instructive for public universities that seek to play a role in business acceleration and economic development in their communities but that may not have a significant research portfolio from which to draw. Regardless of location (urban or rural), public colleges and universities can contribute to local entrepreneurial ecosystems in important ways. According to UBI Index (2014)—a global benchmarking group that evaluates performance of university incubators—the key is to understand the local ecosystem (internal and external to the university) and identify how to add unique value, becoming an integral part of the local ecosystem. PSU accomplished this by building meaningful, reciprocal relationships among faculty, students, local "angel investors" (wealthy individuals who invest in promising businesses in their start-up phases), venture capital firms, mentors, entrepreneurs, and economic development groups.

Three Phases of Development: 2004-2014

The evolution of the PSU Accelerator is best understood by looking at three distinct phases: origins, policy alignment and partnership, and professionalization.

Phase 1 (2004-2006): Origins or "Wild West." The original impetus for the PSU Accelerator was opportunistic. It stemmed from casual conversations between a handful of start-up companies and PSU's then-chief financial officer, Jay Kenton, who had a longstanding interest in business development. Kenton was approached by several small tech companies that were interested in locating

on or near campus to gain access to PSU's first-rate computer science department. These companies sought cheap rent and easy access to faculty members and students to advance their technologies. At the time, PSU did not have the ability to accommodate start-up companies on campus nor could it utilize state-backed bonds to buy a building to house private tenants. These obstacles did not discourage a small group of PSU administrators intrigued by the idea of a business accelerator on campus. Kenton and his colleagues had recently been introduced to the concept of universities as "anchor institutions" driving economic growth in metropolitan regions.

At the time, PSU's administrative leadership was actively engaged with the city's urban-renewal agency in the creation of a strategy for physical development of the growing campus, building on PSU's tradition of community engagement and urban planning. When a suitable building less than a mile from campus came on the market, Kenton devised a creative plan: He asked (and convinced) wealthy private individuals to purchase the building with an agreement that PSU would lease the space and pay down the note on the building through leases. This unorthodox arrangement eventually gave way to a more formal set-up in which the PSU Foundation—a private, non-profit fundraising organization affiliated with PSU—bought the building. While this move better aligned the university's real-estate assets with fundraising, the terms of the deal struck between PSU and the foundation had unforeseen financial consequences that created persistent challenges for the Accelerator.

The future home of the PSU Business Accelerator was just one mile from the heart of the PSU campus. In 2004, however, the building occupied an urban "no man's land" lodged between a set of highways just west of Portland's South Waterfront. Formerly occupied by a local engineering company, the building had sat vacant for nearly a year and the surrounding grid of freeway interchanges, gravel yards, and overpasses provided refuge for transient populations. Despite the somewhat awkward location, the building sat at a location equidistant from PSU and OHSU's emerging South Waterfront campus—a fact that became advantageous as the medical school's footprint expanded over the next decade.

Kenton hired a half-time manager—a former Intel employee with higher-education experience—to launch the Accelerator. Her charge was to build programming,

occupancy, and generate income as the Accelerator opened its doors in early 2004 with three companies. The assumption from the start was that only companies with a firm connection to PSU faculty members would be eligible to rent space at the Accelerator. PSU quickly discovered, however, that it did not have enough faculty members engaged with private companies to fill 40,000 square feet. Historically, PSU was a teaching college. It was established in 1952 to serve veterans wishing to attend college on the GI Bill following World War II, and was not granted full university status until 1969. PSU's identity as an urban research university engaged in scientific and technological inquiry and innovation only began to take root in the mid-1990s. As a result of its history, PSU did not have a dense web of faculty-industry relationships to build upon. In order to fill the Accelerator's building, criteria were quickly loosened to include companies that would commit to hire PSU students. When that proved insufficient, criteria were loosened again so that any technology-related company could apply. By May of 2006, the Accelerator was mostly full. The 23 companies in residence predominantly worked in software development, technology products, and technology services. Two of the 23 companies were based on PSU-originated technology.

Phase 2 (2007-2009): Policy Alignment and Partnerships. Between 2007 and 2009, a flurry of state and local policy innovation targeted at technology commercialization and entrepreneurship positioned the PSU Business Accelerator for success. At the state level, public and private leaders joined forces to create an innovation framework—the Oregon Innovation Council (Oregon InC)—designed to spur industrial development and technology commercialization in fields in which Oregon holds unique, competitive advantages. Key business clusters, including firms focused on nanotechnology, clean technology, and bioscience, formed the basis for new, statewide Signature Research Centers (SRCs). The centers provided university laboratory capabilities for the private sector and commercialization start-up grants for entrepreneurs. Two of three SRCs located in Portland provided a built-in stream of start-ups, aligned with state economic development priorities, to the Accelerator.

At the local level, the city developed and adopted its first economic development strategy in 2009 with a dual focus on industry clusters (computer tech, clean tech, athletic and outdoor companies, and manufacturing) and entrepreneurship. PSU and OHSU were identified as key partners in advancing both agendas, and the

city committed to helping each institution develop expertise in technology transfer and economic development. Following the city's lead, PSU released its own (and first) economic development strategy to closely mirror the city's. One of the first tangible outcomes of the city-university partnership was the city's investment of $1 million in wet lab space at the Accelerator. Portland's redevelopment agency authorized construction of more than 2,000 square feet of new wet-lab space to accommodate the needs of biotech start-ups, for example requirements for particular ventilation and water systems. The wet labs represented a public investment in economic development that sought to gauge demand for such labs in the emerging biotech cluster.

These policy developments all took place in the context of new leadership at PSU. Wim Wiewel, an expert in city-university relations and a proponent of universities as engines of economic growth, became PSU's eighth president in 2008. He pledged to align PSU's capabilities and programming with strategic, regional priorities and to professionalize the research and economic development functions of the university. In 2010, Wiewel established a new executive function, the Office of Research and Strategic Partnerships (RSP), to elevate PSU's research agenda and its role in regional economic development. The office was given responsibility for research, technology transfer, economic development, and strategic partnerships, including the PSU Business Accelerator.

Phase 3 (2010-2014): Professionalizing Innovation and Entrepreneurship. The maturation and professionalization of innovation and entrepreneurship at PSU was led by a new team and fueled by a Portland-based entrepreneurship craze that spawned multiple new seed funds, incubators, accelerators, and tech start-ups. PSU hired a seasoned local leader with deep ties and experience in entrepreneurship to take the Business Accelerator to the next level. Angela Jackson, hired in 2010, tapped her networks and the energy, creativity, and entrepreneurial zeal of Portland's life science and tech communities to cultivate robust relationships among faculty and staff members, students, and local entrepreneurs.

Jackson likes to say that she simply "leveraged a lot of raw material that had not yet coalesced." In fact, she set about creating an intentional community at the Accelerator by pursuing three key strategies: (1) dramatically increasing screening of tenants; (2) building relevant, value-added programming for tenants; and (3) connecting Accelerator companies with external partners, mentors, and investors.

Jackson also co-leads the Portland Seed Fund, a privately managed fund and non-resident Accelerator that provides emerging companies with capital, mentoring, and other connections to propel growth. She also plays active leadership roles in various other organizations related to start-ups across Portland.

Key Strategies

Certain strategies were used to ensure that the Accelerator accomplished its goals. They included:

Tenant Selection and the Tenant Advisory Committee. The success of the Accelerator's tenants can be attributed, in large measure, to a highly selective screening process led by Jackson and the PSU Accelerator Tenant Advisory Committee (TAC). The goal of the TAC is to identify high-growth technology companies that can contribute to the Accelerator's community and provide opportunities and connections for PSU students. Jackson estimates that Accelerator staff members speak with over 100 prospective companies per year. Only the most promising companies are given the opportunity to present to the TAC, which consists of area entrepreneurs, venture capitalists, sector experts, university tech transfer staff members, and economic development professionals. The advisory committee selects companies based on their fit with targeted business clusters (clean tech, software, biotech); potential for growth (defined by job creation); revenue-generation potential; and ability to attract public or private capital. In addition, the committee performs a "give and get" analysis for each firm—that is, what the company will give back to the unique Accelerator community and what kinds of opportunities and connections it will provide for PSU students. The TAC screens out life-style companies, retail and service businesses, and companies that don't have funding in place to reach key milestones.

Community Building and Programming. A shared sense of purpose and community now characterizes the PSU Business Accelerator. It has evolved from a loosely connected group of tenants to "200 people on a mission to change the world" as Jackson likes to say. Tenants share a passion for new technology and seek to bring their products to market. The synergy between the three industry sectors targeted (software, clean-tech, and biotech) means that tenants often have a good deal in common, with knowledge and experience to share. Intentional

programming has built upon this shared foundation to create additional synergy among start-up teams. Routine programming includes:

- Monthly peer gatherings of CEOs, lab staff, and work groups.
- Monthly brown-bag lunch discussions of timely topics ranging from hiring to raising capital to "in-sourcing" technology.
- Scheduled office hours and workshops bringing together strategic partners, mentors, and investors who provide advice and expertise to resident companies;
- Legal and accounting clinics.
- Quarterly "pitch fests" for companies to practice and refine their presentations for potential investors, at which peers, mentors, and investors all provide feedback.
- An annual Company Showcase drawing 200+ investors, PSU faculty and staff members, elected officials, and members of the general public.
- Regularly scheduled social events, generally revolving around food and spirits, that provide a sense of fun and complement the professionally oriented training and networking activities.

Partnership Strategy. The PSU Accelerator taps the growing ecosystem to connect the Accelerator's start-up companies and PSU students to local and statewide resources. Partnerships and community connections are central to how the Accelerator operates and adds value. Regular and meaningful interaction with Angel Oregon, the state's largest competition attracting angel investors, has led to numerous companies in the PSU Accelerator winning funding and top prizes. The accelerator company Nouvola, for example, won the Angel Oregon grand prize of $256,000 in 2014 for its cloud-based performance-and-testing analytic solutions for mid-sized companies.

In addition to Angel Oregon, the PSU Accelerator staff maintains strong relationships with all of the state's Signature Research Centers, other regional accelerators and incubators, economic development organizations, venture capitalists and other investors, and industry associations. Through Jackson's connections and networking, matchmaking of all kinds takes place nearly daily, benefiting accelerator companies, PSU students and faculty members, and community partners.

The results of all this activity? The PSU Business Accelerator is now home to more than 25 start-up companies in clean tech, biotech, and software, including

companies started by PSU, Oregon State University, and Oregon Health & Science University faculty and students. It is the largest business Accelerator in the state offering turnkey facilities with flexible lease terms. Tenants gain access to coaching, boot camps, pitch practice, investors, and mentors. Over the past decade, the Accelerator's companies have attracted more than $150 million in private venture capital and government grants to Oregon. More than 1,100 jobs have been created, hundreds of students have gained hands-on work experience, 10 companies have been acquired, and one has gone public. The Accelerator's companies routinely win funding at Angel Oregon, as noted above, the state's premier angel investment competition. In summary, the PSU Business Accelerator has built a dynamic ecosystem characterized by award-winning technology start-ups and highly engaged faculty, students, and staff.

Metrics and Indicators of Success

As a result of the cumulative efforts described in this chapter, the PSU Business Accelerator punches far above its weight, according to metrics identified by the National Business Incubator Association to evaluate performance. Annual metrics include clients served, programs delivered, job created, salaries paid, private capital raised, grants received, and students receiving work experience. In 2013, Accelerator companies raised $11.8 million in private capital, generated $17 million in revenue, received $4.3 million in grants, employed 196 full-time employees, and provided work experience for 68 PSU students. Very significantly, as both PSU and OHSU's tech transfer functions have matured, the proportion of accelerator companies that are faculty-led or based on faculty IP has increased dramatically. Today, approximately a third of all the accelerator's companies have been generated by PSU or OHSU faculty members' intellectual property.

In recognition of these achievements, PSU's Accelerator was identified as one of the top 25 university business incubators in the world in 2014 by UBI Index, a Swedish research initiative that compared 300 university business incubators in 67 countries in three performance areas: the value to the local ecosystem; the value to the client (start-ups); and the attractiveness of the incubation program. PSU was one of only four U.S. universities to crack the top 25 (UBI, 2014). The other U.S. universities were Rice, Georgia Tech, and Northwest Missouri State. This year (2015) the PSU Accelerator was named "Incubator of the Year, Technology Focus" by the National Business Incubator Association.

Evolving PSU Context

The development and implementation of the Accelerator's programming as described took place in a larger university context in which economic development—including technology transfer, strategic industry and civic partnerships, business acceleration and entrepreneurship—were all gaining momentum and being institutionalized at PSU. The Office of Research and Strategic Partnerships, created in 2010, set out to build university-wide capacity in these areas, thereby providing an institutional home as well as administrative advocacy for the Accelerator and its goals. The office also played a significant role in linking a growing portfolio of faculty invention and discovery to the Accelerator and its services.

A significant result of this alignment has been a new and dramatic increase in entrepreneurship-related curricula and activities across campus, ranging from new faculty start-ups to year-round business competitions and a student-led entrepreneurship club. In academic year 2013-2014 alone, PSU established three new entrepreneurship certificate programs and launched a university-wide Center for Entrepreneurship. The three certificate programs include: (1) the School of Business Administration Entrepreneurship Certificate; (2) the Impact Entrepreneurs Social Entrepreneurship Certificate; and (3) the Maseeh College of Engineering and Computer Science Graduate Certificate in Technological Entrepreneurship.

In response to growing interest and demand from the business and engineering schools, PSU established the Center for Entrepreneurship in 2013 to serve as the center of gravity for all entrepreneurial-related activity at PSU. The center delivers year-round programming for PSU students and faculty to refine, commercialize, and communicate their business ideas, and convenes the PSU "Entrepreneurial Agitators," a faculty and staff group dedicated to advancing entrepreneurship at PSU. The group meets monthly to share information, develop and implement programming, and build community partnerships.

Lessons Learned and Tips for Regional Comprehensive Universities

Bootstrapping is the act of building something from existing, rather than new, resources. Portland State has bootstrapped its way into the top tier of business incubators nationally and globally over the past five years despite a declining state

budget for higher education and limited university general funds. Its success is the combined result of creativity, determination, and a propensity for partnerships. Despite its unconventional origins, the PSU Business Accelerator has played an important role in galvanizing student and faculty interest in entrepreneurship and has catalyzed support for the new Center for Entrepreneurship, including new courses and certificates. The goal now is to move beyond bootstrapping to sustaining and growing the entrepreneurship agenda through a combination of grants, private gifts, and student credit hours.

PSU's path has not been without challenges. Three issues, in particular, have proved thorny over time, requiring much deliberation and a fair amount of handwringing, as described below.

Real Estate Terms. Thoughtful space planning and/or negotiations about real estate are an important foundation for any successful incubator strategy. The unorthodox origins of the PSU Accelerator's real-estate deal resulted in ongoing and unnecessary property-management expenses due to unfavorable lease terms negotiated with the PSU Foundation. Today, the Accelerator is moving to a private property-management model, consistent with the rest of the university, which will free up scarce resources for programming. In addition, administrators responsible for the Accelerator are renegotiating the financial relationship with the foundation to reflect current university budget models and methods.

Staffing and Funding. The Accelerator has a very lean staff. It employs two full-time employees, a director and manager, and various part-time and student workers. The running joke at PSU is that we accomplish a lot with "love and duct tape." Joking aside, this is not a sustainable strategy but rather a recipe for staff burnout. PSU administrators and staff responsible for delivering on the entrepreneurial agenda are now embarking on concerted fundraising strategies to stabilize, better resource, and expand the work. The strong track record established by the Accelerator's performance in recent years provides a good springboard for fundraising.

Institutionalizing Entrepreneurship. While enthusiasm for the Business Accelerator and Center for Entrepreneurship abounds among a key group of

internal and external stakeholders, that enthusiasm does not automatically translate into widespread faculty or curricular support. Many of PSU's entrepreneurship courses are taught by adjunct faculty members, and enrollment is variable. PSU does not yet market its entrepreneurship expertise to prospective students, limiting the student pool to current enrollees. Without a major infusion of philanthropic resources or an uptick in student credit hours attributable to entrepreneurship courses, it is unclear how to institutionalize entrepreneurship as a core component of the PSU curriculum.

"Bootstrapping" Tips for University Leadership

The PSU experience demonstrates that regional comprehensive universities can create significant economic development through non-traditional, business acceleration programs. Admittedly, PSU benefited from its location in a growth-oriented, urban environment. But the partnership approach that was followed, sometimes by accident, can be successfully recreated in almost any setting. The key is to understand the unique assets the university can provide in the context of the local economic environment. McNeese State University in Lake Charles, La., for example, has partnered with the City of Lake Charles and the Southwest Louisiana Economic Development Alliance to create an Entrepreneurial and Economic Development Center (SEED Center) to facilitate the growth of new and existing small business ventures and spur a culture of innovation in Southwest Louisiana—a geographic region dominated by large petrochemical companies.

Even in rural settings, universities can play a pivotal role in developing local businesses. Fresno State University (FSU), for example, has developed a remarkable ecosystem around innovation and entrepreneurship despite being in a predominantly agricultural community. Through the Lyle Center for Innovation and Entrepreneurship, FSU has launched a signature curriculum and mentorship program, creating deep and lasting relationships among first-generation college students, local entrepreneurs, and business leaders. The "Student Hatchery" provides physical space for students to develop businesses and receive coaching from Entrepreneurs in Residence while attending college. By connecting FSU students with the local business ecosystem, the Lyle Center helps retain FSU

students in the San Joaquin Valley upon graduation, a key challenge for Fresno-area businesses that face shortages of skilled employees.

Based on the PSU experience, I offer five tips for university leaders who seek to leapfrog traditional approaches to business acceleration and entrepreneurship.

Identify a leader who can bridge the academic and start-up cultures. Universities are often criticized for being insular and hard to penetrate. To build successful programs for business acceleration and entrepreneurship in partnership with the surrounding community, it is essential to identify a leader with strong relationships and networks outside the university. His or her ability to connect and bridge internal (university) and external (community) resources is fundamental to success. The goal is to create a fluid and permeable model in which the university is viewed as a fundamental part of the ecosystem, not apart from it.

Understand that success requires "bottom-up" and "top-down" approaches simultaneously. By its nature, bootstrapping is a grassroots process. Identify faculty and staff members who are predisposed to support an agenda of innovation and business acceleration. They exist in every college and school across a university and very likely don't know one another. There is power in simply bringing together the people who "get it" and want to "build it." Creativity flows from shared passion and commitment.

At the same time, business-acceleration strategies work best when they are university-wide. If located in a single college, it becomes difficult to build buy-in across campus and build the interdisciplinary teams necessary for success. Executive support for business-acceleration strategies needs to come from the top; the president, provost, or VP for research must champion the effort.

Start by identifying your advantages—no matter how small. Every university and region is different. Start by identifying what your institution can uniquely offer the region's entrepreneurial ecosystem. It may not be faculty research; it might be student labor, lab space, cheap rent, or legal expertise. Inventory the environment, determine what gap the university can fill, and go after it.

Realize that "catching up" is not an option—older programs are decades and millions ahead of you. Large, established research universities with extensive industry partnerships, intellectual-property offices, and multi-million dollar licensing agreements cannot be easily replicated. Rather than playing "catch-up," work to identify the distinct assets your university has that will be of value to the start-up community in your region.

Urban universities without entrenched research and tech transfer functions can have the advantage of being flexible and nimble. They can experiment and interact with the entrepreneurial community in unconventional ways. Today, start-ups can get off the ground with minimal capital investment due to open-source technologies. Business acceleration and entrepreneurship strategies can be equally lightweight, operating virtually through networks until such time that permanent brick-and-mortar approaches are warranted.

Collaborate compulsively! Identifying how the university can add value to the regional entrepreneurial ecosystem requires deep knowledge of that ecosystem. Building relationships and collaborating with local business and industry associations, investor groups, economic development professionals, entrepreneurs, and local and state policy-makers enables the university to align its programming with the needs of various stakeholder groups.

The mash-up of public, private, and university expertise can lead to unexpected and remarkable outcomes. Most importantly, it can create an environment in the community and on campus that will prompt a re-thinking of the mission of the comprehensive university and offer creative problem-solving to enhance with the role of the university in regional economic prosperity.

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Promoting the International Dimensions of Regional Development

Richard Dunfee

Overview

There are many reasons to promote the relationships among international economic and community-development projects, postsecondary education, and the health of local and state economies. The range of institutions' international programs that have a relationship to regional workforce and community development will be reviewed and examples cited in this section of *Operationalizing Stewards of Place*. In addition, potential sources of public and private funding for international programming will be identified, along with issues that need to be considered when planning for new or expanded opportunities.

The use of project-management principles to develop funding proposals and craft memoranda of understanding (MOUs) will be reviewed with emphasis on meeting requirements for non-discrimination, developing sound and transparent budgets, creating specific project goals and objectives, specifying outcomes expected by everyone involved, and advancing fundamental human rights.

The basis for this approach to international development involves three principles. First, a component of campus international programming should promote the quality of a skilled workforce to support regional engagement in a global economy. Second, off-campus partners need to be engaged in the development of international plans, and these partners need to commit to the assessment of the impact of these programs. Third, sponsored-programs expertise in negotiation skills and contract formats should support effective campus-based outreach efforts.

It seems a contradiction to be addressing regional engagement and international programming simultaneously. Nevertheless, the reality of economic development today requires that institutional leaders constantly explore international

opportunities to enhance the quality of students' preparation for the workforce and adequately address the economic vitality of the institution's region and state.

Serious attention to international relationships that can result in community, economic, and workforce development is a recent phenomenon. Governors, state legislators, and local economic-development authorities have increasingly prompted educational leadership to actively engage international campus-based and off-shore contacts to advance regional participation in the global economy.

These regional/international projects have taken many forms, with some following a traditional academic exchange path with a clear community/economic-development dimension:

> The Center for Border Economic Studies (CBEST) at the University of Texas Pan American, soon to be the University of Texas Rio Grande Valley, undertakes public-policy research targeting challenges and issues unique to the culture and economy of the U.S./Mexico cross-border region. Interdisciplinary research engages faculty and students in the examination of a range of community and economic-development issues: trade, entrepreneurship, innovation, social mobility, human capital, health disparities, environment, immigration, and student access. CBEST publishes the "Border Business Brief" (BBB), a quarterly newsletter addressing economic and social issues in the Rio Grande Valley and North Tamaulipas region. The center also fosters strategic partnerships with private-sector groups, foundations, government agencies, research scholars, and non-profits.
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> Delta State University in Mississippi has a three-year grant from the Robert M. Hearin Foundation to establish the "Delta Blues Project." Part of this project involved holding the first annual International Conference on the Blues in October 2014, an academic gathering that brought together participants from countries such as Canada, France, Russia, Norway, and England.

> The Village Aid Project-Engineers without Borders (VA-EWB) at Fort Lewis College in Colorado is a student-centered, humanitarian organization whose mission is to collaborate with needy communities in the developing world to find sustainable solutions to their critical engineering problems. The program trains a new generation of students who understand the need for sustainable systems and who value the concept of responsible global citizenship. Students take advantage of opportunities to work on meaningful projects, enhance their ability to be responsible citizens, and learn from professional mentors and local volunteers while participating in a truly community-oriented effort.

Both the public and the private sectors also increasingly value skills in foreign languages and international cultural knowledge as important workforce skills. To meet needs in regional development and promote international competitiveness, courses and programs in industry-specific workforce preparation have been developed, including:

> Bowie State University in Maryland participates in the Mid-Atlantic Consortium-Center for Academic Excellence (MAC-CAE), a workforce-development effort for the intelligence community with an emphasis on South Asia. The MAC-CAE project builds on a number of best practices for preparing students for intelligence careers, training a cadre of students to navigate "human terrain" systems, including language and culture, specific to South Asian countries. These include Afghanistan, India, Pakistan, Sri Lanka, Bangladesh, Nepal, and Bhutan. The students' learning experience includes a trip to India to immerse them in the region's language and culture.

> Florida Atlantic University, the Johns Hopkins University, and Northern Arizona University are participating in student/faculty health-services projects in Guatemala. The travel and projects are coordinated through Nursing Heart Inc., a Minnesota-based not-for profit, and support for the program is provided by Guatemala-

based non-governmental organizations (NGOs). The program frequently offers academic credit for the experience in international nursing or health. Groups travel to the Central American country to build health facilities or offer primary health clinics and screenings in rural native communities.

The primary difference between traditional study-abroad programs and today's international-education agenda relates to the need to realize specific outcomes for economic/community/workforce development. Thus it is useful to review the agencies and organizations that fund and support these efforts.

Federal Support

A range of federal agencies offers support for international economic and community development. All the programs reviewed here encourage grants to higher education.

The U.S. Department of State. A noteworthy funder of international projects, the State Department tends to focus its support for grants and cooperative agreements on global mutual understanding. Through its Bureau for Educational and Cultural Affairs (ECA), non-profit organizations can pursue a range of opportunities involving academic, cultural, and professional-exchange programs.

The State Department has a number of interest areas for which it regularly accepts proposals: Capacity Building Program for U.S. Undergraduate Study Abroad; International Programs to Combat Trafficking in Persons; International Sports Programming Initiatives; Middle East Partnership Initiative (MEPI); and Title VIII Program for Research and Training on Eastern Europe and Eurasia. All grant opportunities are posted on grants.gov.

U.S. Agency for International Development. USAID, an agency of the State Department, operates in over 100 countries to address the following development needs: to promote broadly shared economic prosperity; strengthen democracy and good governance; protect human rights; improve global health; advance food security and agriculture; improve environmental sustainability; improve education;

and provide humanitarian assistance in the wake of natural disasters and human conflict. Funding through USAID encourages the establishment of partnerships between U.S. organizations, in many cases universities and colleges, and international non-government organizations to manage economic and community-development projects. For example:

> California State University, Fullerton (CSUF) and the Universidad Autonoma de Tlaxcala (UAT) received a grant from USAID to address the surge in Type 2 diabetes in the Tlaxcala region in Mexico. CSUF collaborated with UAT to evaluate current lifestyles, increase understanding of sociological and economic perspectives influencing primary and secondary health care, and design a program to empower Tlaxcalans to maintain healthy lifestyles. The project ultimately aimed to prevent obesity and the concomitant diseases related to obesity such as diabetes, metabolic syndrome, high blood pressure, and cardiovascular disease. The grant focuses on the development of a model for community-based wellness and the design of healthy lifestyle programs to address the related needs of low-income urban and rural residents and the needs of the professional and para-professional staff members who provide services to meet these needs. CSUF conducted research at the university and in the community in order to design a relevant internship program. The project team approached the challenge through such activities as faculty and student exchanges; a training program for UAT students in public health or nursing, including internships in key health programs in California; and education and research opportunities for CSUF faculty and students.
>
> Fort Valley State University (FVSU) in Georgia is a sub-contractor on a USAID project managed by Oklahoma State University, the "Ghana Innovation Lab for the Reduction of Post-Harvest Loss (PHL)." This project assesses current tactics for handling grain and managing pests, including in stored products, and post-harvest grain losses. The ultimate goal is identifying researchable areas in post-harvest losses that can support significant improvements

in food security. This project focuses on identifying simple, cost-effective, and readily implementable technologies that can be used to mitigate losses caused by grain fungal infections (aflatoxins) and insect pests in storage warehouses in Ghana. Among 10 technologies that are being pilot-tested for implementation in Ghana, Fort Valley has responsibility for two approaches: food and pheromone-baited traps for monitoring insects inside and outside warehouses and strategic grain reserve sites, as well as the use of Purdue Improved Crop Storage (PICS) hermetic triple-layer bags to prevent infestations.

Most of USAID's funding is dependent on the establishment of partnerships involving both international and domestic (including higher education) organizations. In the agency's words, "USAID recognizes that achieving sustainable solutions to global challenges requires us to work in close collaboration with countries, partners of all sizes, citizens and the wider development community." (USAID Partnerships Website, March 11, 2015).

In recent years, USAID has sought to increase its engagement with institutions of higher education and their international partners for several reasons. They include promoting evidence-based programs; committing to an elevated focus on science and technology; demonstrating an imperative to broaden the partner base; and developing the next generation of development professionals. Examples of that work include the following initiatives:

- The *Higher Education Solutions Network (HESN)* engages a global interdisciplinary network of laboratories designed to solve distinct development challenges. These labs are helping USAID and the development community to discover more innovative, results-driven, efficient, cost-effective, and accessible solutions to global development challenges in areas such as global health, food security, and chronic conflict.
- *Partnerships for Enhanced Engagement in Research (PEER)* is helping to level the playing field by directly funding scientists and engineers in developing countries who have formed collaborations with high-caliber researchers funded through other U.S. federal research agencies, including the National Science Foundation and the National Institutes of Health.

- The *Collaborative Research Support Programs* address hunger and agriculture through a network of over 500 collaborating institutions, with projects implemented in more than 55 host countries. This long-term collaborative research aims to improve agricultural productivity and marketing systems and to enhance food security. The programs have trained over 3,700 students in the agricultural sciences.
- The *American Schools and Hospitals Abroad (ASHA)* program has been expanding educational and medical opportunities across all regions that USAID works for more than 50 years, supporting institutions that demonstrate U.S. educational and medical standards. Since its inception, ASHA has assisted 257 institutions in 76 countries. (USAID partnership-opportunities website, October 30, 2013).

One other program, announced in April of 2015, is the Young Leaders of the Americas Initiative (YLAI) (website, April 9, 2015), which is designed to increase opportunities for emerging entrepreneurs and civil- society activists. This White House initiative will expand education, training, and employment programs for youths throughout Central America and the Caribbean through $68 million in new funding to be administered by USAID, the Department of Labor, and the Millennium Challenge Corporation. The initiative will provide 250 fellowships each year to develop joint business and civil-society initiatives between the United States and regional partners. The initial group of fellows will be based at universities, business incubators, and non-governmental organizations across the United States, while follow-on exchanges will send Americans to Latin America and the Caribbean to continue the collaboration. In order to encourage the creation and growth of business and civil-society initiatives that utilize technology, YLAI will begin a pilot program this year that will embed participants from throughout the region in business incubators and accelerators across the United States. Under YLAI, the White House plans to foster more than 50 formal business and civil-society partnerships each year between appropriate entities in Latin America and the Caribbean and their counterparts in the United States.

Fulbright. The State Department also contracts with the Council for the International Exchange of Scholars (CIES) to administer the Fulbright program. While most of the activity associated with Fulbrights involves discipline-specific

exchanges of individual scholars,, Fulbright opportunities extend to programs that support university and college teachers, students, and faculty members working as teams focused on a specific issue. In addition, the Fulbright-Hays-Group Projects Abroad Program, administered by the U.S. Department of Education (ED), provides grants for international projects involving training, research, and curriculum development in modern foreign languages and area studies. Activities may include seminars, curriculum development, research, or intensive language training. (Fulbright Programs website, n.d.)

Another CIES program of note supports the participation of senior university administrators, including those involved in economic outreach, in two-week summer seminars in various countries. Seminars introduce participants to the society, culture, and higher-education systems of those countries through visits, meetings with foreign colleagues and officials, cultural events, and briefings on education. Aside from facilitating later student exchanges, these opportunities can help to establish networks to support programs for community and economic development. Applicants must be U.S. citizens who have significant responsibility for international programs and activities. Annual deadlines occur around this approximate schedule: February (France and Germany), July (India), and November (Japan and Korea). Programs in the United.Kingdom are offered during odd years (Fulbright Senior Administrator website, n.d.).

Other Federal Programs. A few other federal programs offer international funding:

- National Endowment for the Humanities (NEH)
  - Bilateral Digital Humanities Program
  - Digging into Data Challenge
  - Fellowship Programs at Independent Research Institutions

- National Institutes of Health
  - International Research Ethics Education and Curriculum Development
  - International Research Scientist Development Award

- National Science Foundation
  - Catalyzing New International Collaborations
  - East Asia and Pacific Summer Institutes for US Graduate Students (EAPSI)
  - Graduate Research Opportunities Worldwide (GROW)
  - International Research Experiences for Students (IRES)
  - Ocean Drilling Program
  - Office of International Science and Engineering (OISE)
  - Pan-American Advanced Studies Institutes (PASI)

- U.S. Department of Agriculture
  - Scientific Cooperation Research Program
  - U.S.-Israel Binational Agricultural Research and Development Fund (BARD)

- U.S. Department of Commerce
  - Market Development Cooperator Program

- U.S. Department of Education
  - Business and International Education Program
  - International Research and Studies Program
  - Language Resource Centers
  - Technological Innovation and Cooperation for Foreign Information Access
  - Undergraduate International Studies and Foreign Language Program

- U.S. Department of Energy
  - Nonproliferation Graduate Fellowship Program

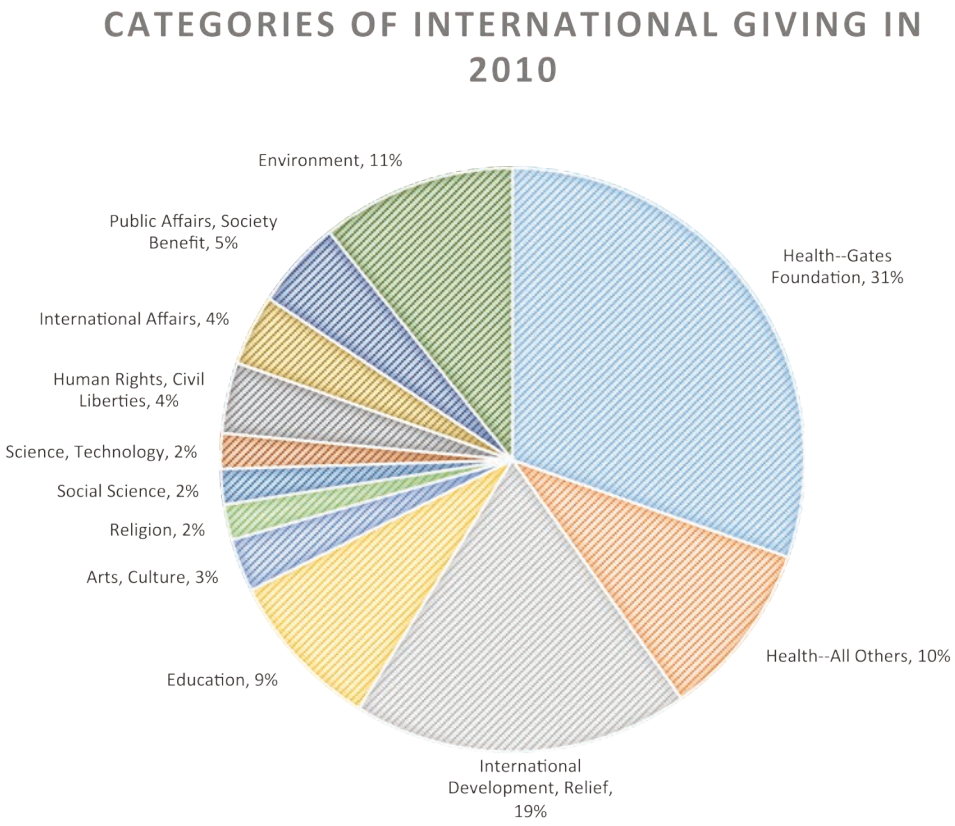
- U.S. Institute of Peace
  - Jennings Randolph Program for International Peace
  - Priority Grant Competitions

Private Foundation and For-Profit Business Support

As concerns about U.S. competitiveness in the global economy have grown, the interest in funding project-specific international activities sponsored by colleges and universities has also increased. However, there are distinct differences in the

priorities of the not-for profit organizations, which support social and cultural advancement, and the business communities that seek business expansion.

Private Foundations. A 2012 report published by the Foundation Center showed that between 1982 and 2010 the dollar commitment to international projects among U.S. foundations increased from 5 percent to 20 percent of total giving. As the following chart illustrates, the report cites the priorities for giving as health-related (41 percent of international projects), international development/ relief (19 percent), the environment (11 percent), and education (9 percent) (The Foundation Center, International Grantmaking Update, 2012).



Percent of Dollars—Total Giving for International Programs = $4.3 billion

Source: The Foundation Center, International Grantmaking Update, 2012

A similar set of priorities is evident in a search conducted of private foundation giving in 2015. A total of 1,855 private foundations identified "international" grant making as a part of their portfolio. Of that total, individual private funders identified interest in these international areas: development or relief (78), education (55), health (33), and economic development (13).

For-Profit Business Community. Virtually every state has recently introduced new or enhanced existing programs that encourage universities to engage with local economic-development authorities and employers to promote a healthy economy and skilled workforce. These initiatives can and do involve international partners. For example:

> Montana State University (MSU) Billings established a partnership with Taisei Techno Ltd., a Japanese wind turbine company, and local Billings firms to construct a wind turbine training and research facility on the campus. Four Montana businesses collaborated in the project. The $80,000 turbine, which also will generate electricity for the MSU Billings West End campus, eventually will be donated to MSU Billings. Students in the College of Technology's Sustainable Energy Technician Program will be monitoring and collecting data from the new wind turbine. Through the program, students learn basics such as electronics, physics, pneumatics and hydraulics, which can be applied to a long list of sustainable-energy technologies such as wind, solar, fuel cells, geothermal, hydroelectric, and internal- and external-combustion engines.
>
> University of Texas Pan American (soon to be the University of Texas Rio Grande Valley through the consolidation of the University of Texas Pan American and the University of Texas Brownsville) works with the partners within the region, such as economic-development corporations and chambers of commerce, to recruit and retain corporations in South Texas to expand the regional economy. University representatives serve on the boards of these organizations and support their efforts as a team. One example involves Alps Electric, a large Japanese company with

> manufacturing facilities in the region that needed to manufacture tools locally for its plant in Reynosa, Mexico. Having such capability on the Texas/Mexico border cuts the time lost in overseas development of prototypes for manufacturing parts. The McAllen Economic Development Corporation, the University of Texas Pan American, and the South Texas Community College, in partnership with Apls Electric, launched a Machine Tooling Academy in the Rio Grande Valley. Pan American is leveraging an existing manufacturing consortium grant to make this happen. The university routinely works with regional partners to support regional economic-development initiatives.

These examples make it clear that there are multiple ways for institutions to engage as partners in promoting international business activity, including through regional partnerships, and at the same time address development of workforce skills for students. The regional cluster approach developed in the last six years across the federal government, managed primarily through the Economic Development Administration in the Department of Commerce, should be seen as a way to internationalize the local economy as well as promote regional economic vitality.

Challenges to Productive International Activity

Dealing with the scope of potential problems or challenges involves choosing the right partners, understanding cultural differences, advancing human rights, and meeting government compliance requirements. It is incumbent on institutional leadership to investigate fully the potential pitfalls of doing business outside of the U.S.

Appropriate Partners. Choosing and cultivating the right partners, both domestically and internationally, is the first challenge. It is critically important that the skills and abilities of the partners complement the goals of the university or college efforts. It is essential that the potential partners be investigated to determine that there is no history of illegal or unethical (by U.S. standards) activities associated with the organization or business. There are several ways to

investigate an organization: Examine the organization's audited annual reports; obtain references from a local chamber of commerce or economic-development authority; request a confidential banker's report through the university's bank or the state attorney general; obtain background profiles of the organization's leadership; research the history of litigation and fraud charges through court records and local newspapers; and search for information on previous research-and-development activities and investments.

If international travel is involved in partnership development and the trip includes the promotion of exports by local business, the U.S. Department of Commerce's Trade Mission program is an important resource. This program supports U.S. businesses pursuing export opportunities in foreign markets. Trade Mission status can be pursued by contacting the export office at the department (Trade Missions website, October 8, 2014). Support from the program includes help arranging meetings with foreign industry executives and site visits to business sites, screened according to business targets; networking events with guests from local industry and governments; and information sessions on local business practice, legal requirements, and cultural issues.

Many institutions are drawn into trade missions to exploit contacts through existing international education programs or to encourage new educational or economic relationships to benefit the region or state. If the state government is formally involved with U.S. companies in export-promotion activities, a Certified Trade Mission can be arranged and hosted by the Department of Commerce's Commercial Service overseas offices. An agreement, signed by all participating U.S. entities, details roles and responsibilities associated with the travel events.

Even if export activity is not on the agenda when identifying potential partners, the university or college should seek information on any potential partners through the State Department, the Department of Commerce, or federal law-enforcement agencies. If information is not available through any other source, it is advisable to retain a private investigation firm. The point of this intelligence gathering is to avoid legal, ethical, or financial problems at all costs.

Cultural Differences. It is essential that adequate time and effort be devoted to understanding the intricacies of the culture of the foreign country in which you plan to develop a relationship or engage in service projects or research. In some countries, women are denied basic human rights, child labor laws are lax, and discrimination is sanctioned against certain ethnic, religious, or gender preference groups. Particularly for public institutions of higher education, ignoring these cultural challenges can result in legal problems involving the international relationship, and disruptions of on-the-ground services. Simply stated, it is a mistake to assume that one can change the world to model U.S. standards, but it is unethical to take public resources (even if in-kind) and allow them to be used for activities that violate U.S. law or cultural standards.

When considering a relationship with an organization in a foreign country, it is also advisable to check the status of State Department travel advisories and warnings. These provide information on immediate threats to safety, reports of fraud or illegal activity, and areas of the country that are experiencing civil unrest.

Social Justice. The international projects in which higher education engages should always have as a priority advancing basic human rights. And the likely funders of projects involving colleges and universities today are actively supporting these values. For example, the international Human Rights Funders Group, a global network of donors and grant makers, is committed "to advancing human rights around the world through effective philanthropy." (International Human Rights Funders Group website, n.d.) The United Nations has also weighed in with its Millennium Project, promoting study, projects, and research involving 15 global challenges confronting humanity. Finally, USAID includes the following wording in its mission statement: "We partner to end extreme poverty and to promote resilient, democratic societies while advancing our [U.S.] security and prosperity."

Thus higher education's involvement in the international economic, educational, and healthcare systems must do more than avoid entanglements that might involve discrimination or injustice. Funding proposals and projects must seek to advance international and U.S. values regarding these issues.

Compliance. An institution must consider all aspects of compliance with federal and state regulations when developing an international relationship or conducting research or program development with international partners. This is true even if the program does not receive direct federal support. Federal and state regulations on topics as diverse as strictures against discriminatory practices in hiring and providing services, the application of appropriate financial controls and audits, the management of human subjects' protections, standards associated with animal care and use, and requirements involving the reporting of project outcomes (transparency) must be observed.

Export Controls. When doing business in a foreign country, it is also essential that federal mandates associated with export controls be strictly followed. U.S. export control regulations protect U.S. security and support domestic economic development. Importantly, failure to comply with these regulations can result in institutional and personal fines and, in some cases, incarceration (jail time).

The federal laws and regulations associated with the U.S. Export Control systems are set forth in the Arms Export Control Act, which regulates the transfer of commodities, technology, software, source codes, information, and services either through direct transfer to a location outside the U.S. or as a "deemed export" involving transfer to a foreign person within the U.S. The regulations are administered by several federal agencies: the Department of Commerce's Bureau of Industry and Security under the Export Administration Regulations (EAR); the Department of State's Directorate of Trade Controls under the International Traffic in Arms Regulations (ITAR); the U.S. Department of the Treasury's Office of Foreign Assets Control (OFAC); the U.S. Nuclear Regulatory Commission (NRC); and the Department of Energy (DOE).

The export of a controlled technology or item can take place in the U.S. or abroad in many ways: shipping or traveling abroad with equipment, software, or other technology; touring a lab with controlled technology; communicating (electronic, written, or verbal) about technological or software solutions developed in the U.S.; and training or educational programming involving controlled items or technology. Therefore, it is essential that equipment such as computers are examined carefully before foreign travel is undertaken to make certain nothing is taken abroad, even inadvertently, that could be related to a controlled technology or item. It is also

important that someone on the faculty or in the sponsored programs office have the responsibility of assuring compliance with export controls for international projects.

International Intellectual Property. Commonly referred to as original creations of the mind, intellectual property (IP) includes the following: unique discoveries and inventions; artistic works involving art, music, and literature; and trademarks, including symbols, phrases, and designs. Under intellectual-property laws and regulations, owners of intellectual property are granted certain exclusive rights. However, these protections are dependent on following the proper invention disclosure, patent, and copyright filing procedures.

The United States Patent and Trademark Office has jurisdiction over IP regulations in the U.S., while the World Intellectual Property Organization (WIPO) establishes international rules. The main concern for universities that do business internationally is to takes steps to protect the intellectual-property interests of the state, institution, and faculty/staff. Every institution, therefore, should have access to legal support that guarantees that property rights are protected and trade secrets are never disclosed inappropriately.

Advice for Leadership: Using the Proposal or MOU to Overcome Challenges

Every campus activity that has the potential to engage foreign nationals, companies, non-governmental organizations, or universities should be based on a written agreement among all parties. The document can take the form of a proposal, if funding is sought, or it may involve a memorandum of understanding (MOU) among the parties outlining the joint activity. Regardless of the format, a binding written agreement must be developed. Certain key project-management elements are essential in these agreements:

- All parties, domestic and foreign, must specify what contributions they are making to the activity. This should include both cash and in-kind support.

- All parties must also specify what they benefits they will receive from the project, in both tangible and intangible ways.

- The representative of every organization involved should be specified and the role of that individual relative to the project must be detailed.
- The agreement should have a budget associated with it reflecting the contributions of all participants.
- A timeline should be included, which reflects a realistic sequence of events.
- The outcomes of the project must be specified in quantitative and qualitative terms.
- A set of goals and objectives for the project need to be associated with project benchmarks that show a progressive movement through time to achievement of the outcomes.

The links among the goals, objectives, and expected outcomes (for all parties) need to be specific and clear. Additionally, a coherent narrative that also links the activity to the budget must support these relationships. Commitments of support from all parties must be substantial and, as noted above, detail the resources that each participant brings to the project. It is no longer acceptable to have partners merely indicate their general support for the project; today, all parties must commit cash or in-kind support that can be substantiated and audited.

Achieving Transparency. A well-crafted and specific project plan will serve to justify the commitment of state or private resources to the project based on the outcomes specified. At times, some private partners will demand that a degree of confidentiality be observed, but this cannot be the sole governing principle, particularly if a public university is asked to explain its commitment of public resources to a project.

Overcoming Cultural Challenges. The best protection for the institution and the integrity of the project involves building in anticipated problem areas in the benchmarks, outcomes, and goals/objectives for the project. For example, in countries where gender and ethnic discrimination is at odds with U.S. standards or regulations, including targets for participation rates among various ethnic or

religious groups and women could trigger early warnings involving discrimination issues. Making these targets explicit in the proposal or agreement also signals the values that are essential moving forward.

It is unfortunate that many projects stumble on this issue. A very successful project can and should be terminated if it is determined discriminatory practices are being followed. However, it is better to know this during the project so corrective action can be taken and the institution can attempt to manage any negative publicity. Not every country in the world has the same standards for child labor or working hours or conditions. Other countries may not embrace the environmental standards used in the U.S. In these cases, the project must be administered in such a way that no U.S. dollars, private or public, support any activity that would be illegal in the U.S.

Applying Compliance Standards. A recent NIH-funded project in South Asia was terminated because protocols for protecting human subjects were not followed. This serves as a reminder that all governmental compliance standards must be observed whenever U.S. dollars (public or private) are committed to a project outside the U.S. This applies to all the compliance issues reviewed here: financial, safety, human subjects, animal care, and environmental.

Metrics for International Activity

As with most educational activity, some things are easy to measure while others are not. If you are dealing with a situation in which a project has direct impact on a business or service, then it is possible and necessary to measure the economic and employment outcomes of the activity. There are often short-term measures (under three years) that can be examined: jobs created, profits realized, business expansions undertaken.

Most international programs increase the international capabilities of students and have a longer-term impact on the local U.S. economy. Assessing this type of activity can be challenging for two reasons. First, most institutions do not engage the local employer community (both for-profit and not-for-profit) early in the development of international educational exchanges. Therefore, the international

perspectives, plans and expectations of the economic and community-development leaders in the region are not incorporated into institutional plans for developing the international program.

Second, it is very difficult to trace the impact of students' and faculty members' international engagement on the local economy. There are long-term impacts that no doubt are important, but very few institutions have a data-collection plan in place to harvest this type of information. However, there are some programs being developed at postsecondary institutions that might strengthen the relationship between international programs and workforce development.

For example, Bemidji State University in Minnesota has several departments that offer discipline-specific programs involving students—social work in Mexico; environmental science in Canada; nursing in Belize. The university has also established a work-opportunities program for students studying in China. The University of Wisconsin Eau Claire has introduced a program to assist academic departments with building relationships with peer departments elsewhere in the world, and with incorporating internationalization and global engagement into departmental programming. Partnership-building mechanisms include student-faculty exchanges, shared research, and collaborative teaching and learning. Recent partnerships have included the City University of Hong Kong, Pontificia Universidad Catolica del Peru, and the Universities of Aberdeen and Glasgow in Scotland.

Thus we are moving closer to a model that could establish a more-focused relationship between student learning and employer priorities. This would be valuable as we consider placing more importance on the internationalization of the curriculum and its impact on the local economy and the quality of the workforce.

Conclusion

The importance of postsecondary institutions serving as drivers of economic/community/workforce development has become broadly accepted in the past six years. However, the international dimensions of this regional-engagement strategy for economic and community outreach are only now beginning to take shape. AASCU institutions possess significant un-realized capacity to add international value to their regional outreach.

It is evident that an international component to economic, community, and workforce-development strategies is essential. Institutions must approach projects in this area with fully vetted regional and foreign partners, a written agreement binding all on-campus and off-campus participants, and clear and precise ways to measure the impact of the projects. To achieve this, institutions must cultivate the best legal and financial advice available and develop the capacity to negotiate sound agreements. Done correctly, these international projects can succeed and become powerful vehicles for proving the state and regional value of institutions' contributions.

About the Author

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Assessing Regional Economic Development Efforts with Metrics

Ashish Vaidya

Overview

The institutional members of the American Association of State Colleges and Universities (AASCU) are place-based, anchored within their regions, and increasingly recognized as key contributors to economic, community, and workforce development. The universities' contributions cover a broad spectrum of activity, from educating students and creating the workforce needed for the region, to developing innovation ecosystems and the support necessary for entrepreneurship to enhance economic, social, and cultural development in their regions (APLU's CICEP). Equally important is that universities be able to explain to a variety of stakeholders, both internal and external, the precise impact of their regional economic engagement.

Metrics provide the basis for universities to plan, assess, demonstrate, and prove their contributions to their regions' economic health. The development of metrics is being encouraged by the White House, state legislatures, federal agencies, governors, private employers, and national associations. The choice of metrics should support the range and complexity of universities' economic engagement. Typically, these activities focus on four broad areas: advancing innovation through knowledge creation in the local and regional economies; helping employers through knowledge transfer; community revitalization; and creating an educated population (Bhadury et al, 2010).

Selecting the right set of metrics will require a clear understanding of the connection between an institution's planned work and the intended results (APLU CICEP, 2014). The value of a metric is not just a function of what an institution wants to say, but also is contingent on the value of the measure to the stakeholders the institution is trying to convince. This chapter will provide an overview of metrics suggested by various entities, examples of the use of metrics by colleges and universities, and suggestions that AASCU institutions can use to develop appropriate metrics to assess their regional impact.

The development of metrics to measure university contributions to regional economic advancement has been influenced by the work of federal agencies including the National Science Foundation (NSF) and the Department of Commerce, as well as by national organizations such as the Association of University Technology Managers (AUTM) and the Association of Public and Land Grant Universities (APLU). In addition, the economic-impact reports generated by the California State University (CSU) System have played an important role in the evolution of metrics that address state-wide and regional returns on investment.
National Science Foundation (NSF)

In 2010, John P. Holdren, assistant to the President for science and technology and director of the White House Office of Science and Technology Policy, said, "it is essential to document with solid evidence the returns our Nation is obtaining from its investment in research and development, and STAR METRICS is an important element of doing just that." STAR METRICS is a collaboration among federal and research institutions to create a repository of data and tools that will be useful to assess the impact of federal R&D investments. The National Institutes of Health (NIH) and the National Science Foundation (NSF), under the auspices of the Office of Science and Technology Policy (OSTP), are leading this project. It has been developed after a successful pilot project was conducted with several research institutions through the Federal Demonstration Partnership (FDP). According to Lane and Bertuzzi (2011), the project consists of two implementation phases:

- **Phase I.** Develop uniform, auditable, and standardized measures of the impact of science spending on job creation, using data from research institutions' existing database records.

- **Phase II.** Develop measures of the impact of federal science investment involving:
  - scientific knowledge (using metrics such as publications and citations)
  - social outcomes (e.g., measures of health outcomes and environmental impacts)
  - workforce outcomes (e.g., student mobility and employment)
  - economic growth (e.g., tracing patents, company start-ups, and other measures).

As a voluntary program, the STAR METRICS project relies on recipients of research funding for the project to be successful. Therefore, the STAR METRICS approach is designed to be as easy as possible for participating institutions, and the STAR METRICS team works with institutions during each step to provide information, guidance, and support.

STAR METRICS are aligned with agency reporting requirements within these categories:

- Direct jobs, calculated from individuals employed
- Estimates of employment resulting from purchases made from vendors
- Estimates of employment resulting from sub-awards
- Estimates of employment created from overhead.

More than 40 universities have agreed to participate in this project. The development of NSF's research.gov website and NSF reporting-transparency requirements will accelerate the use of these impact metrics.

Department of Commerce

In October 2013, the U.S. Department of Commerce issued a report titled "The Innovative and Entrepreneurial University: Higher Education, Innovation, and Entrepreneurship in Focus." The report illustrated how universities are supporting innovation and entrepreneurship to strengthen regional economies and create jobs while keeping America competitive. It was prepared by the Office of Innovation and Entrepreneurship (OIE) in consultation with the National Advisory Council on Innovation and Entrepreneurship (NACIE). This report resulted from a letter submitted through NACIE to the Secretary of Commerce in April 2011 by the leaders of 142 universities and associations (Recommendations to Facilitate University-based Technology Commercialization). Muriel Howard, president of AASCU, signed the report along with a number of AASCU institutional leaders. The report highlights efforts undertaken by higher-education institutions in each of five broad categories:

Promoting Student Innovation and Entrepreneurship. Examples include courses in entrepreneurship, opportunities for experiential learning, student business- plan competitions, and programs that put multidisciplinary student teams to work solving real-world problems.

Encouraging Faculty Innovation and Entrepreneurship. Examples include providing financial incentives for faculty members, facilitating faculty-industry collaboration, and campus recognition of faculty members' innovation and entrepreneurship.

Actively Supporting Technology Transfer. Examples include establishing policies and programs to facilitate technology transfer, adequately supporting the infrastructure of technology transfer offices, and creating opportunities for engagement with external partners.

Facilitating University-Industry Collaboration. Examples include establishing access to on-campus research expertise, intellectual property, and commercial opportunities.

Engaging in Regional and Local Economic Development Efforts. Examples include expanding university participation in national, regional, and local economic development efforts, promoting access to university assets for regional industries, and partnering in community development and revitalization efforts.

As federal agencies begin to improve their external partnerships and to more effectively support university programs that promote innovation and commercialization, institutions will need to pay particular attention to developing a set of measures to show their commitment to a federal economic development mandate.

AUTM (Association of University Technology Managers)

The Association of University Technology Managers (AUTM) has spent the past three years exploring new metrics for technology and knowledge transfer. The group has produced an annual survey of licensing activity for over 20 years and has established a repository of all quantitative surveys of technology transfer metrics that have been conducted by affiliated organizations. In addition, AUTM has worked with U.S. higher education associations, governmental organizations and non?profit groups to identify new metrics.

As a result of these actions, AUTM has drafted a proposal for metrics to describe and assess the ability of a given institution to make an impact on its surrounding

community and economy. This draft proposal is intended to stimulate a discussion of which specific measures are suitable for the needs of a broad range of institutions and stakeholders. AUTM monitors research and technology transfer activity through annual licensing surveys administered to all participating institutions. Answers to the survey questions provide a measure of the impact of technology transfer activity on the community and the region. However, since institutions define their goals and communities differently, these answers might not be comparable across institutions. These measures allow institutions to identify their own goals and provide the context to external constituents in order to provide better information about their regional impact.

AUTM recognizes that economic impact is determined by a number of factors, including the economic ecosystem in which the institution operates, the range of channels through which university knowledge flows to the end user, and the fact that final impacts are often created by partners of the university. Thus, no one simple direct measure can capture the full extent of the institution's impact. AUTM suggests instead that a range of measures be developed to capture key elements about the institution, the community, and the offices and players that have specific responsibilities for creating the economic impact.

AUTM has proposed the following themes as being appropriate for inclusion in the metrics:

- Institutional support for entrepreneurship and economic development—e.g., the institution has stated goals, policies and resources which support institution and community engagement.
- The ecosystem of the institution—e.g., state and city policies and procedures which enable easy business establishment.
- Human transfer activities—e.g., the number of students enrolled/graduated/year.
- Technology knowledge transfer activities—e.g., the number of agreements signed by institution to enable external use of institution technology.
- Network creation activities—e.g., community engagement events for increasing economic interactions held by institution designed for community.
- Value creation activities—e.g., licensing income.

AUTM intends to continue to measure key technology transfer indicators and activities and work with other organizations to define new measures. In addition, AUTM will continue to work with other stakeholders within the innovation ecosystem to create a comprehensive set of measures which will enable institutions to provide a more complete picture of institutional impact within their respective ecosystems.

Association of Public and Land Grant Universities (APLU)—New Metrics

APLU, a research, policy, and advocacy organization representing 235 public research universities, land-grant institutions, and state university systems, established the Commission on Innovation, Competitiveness, and Economic Prosperity (CICEP) to help member institutions plan, assess, and communicate their work in local and regional economic development. According to the CICEP's taxonomy, university contributions can be summarized as talent, innovation, and place, with overlapping contributions at the intersection of the three areas. The CICEP economic-engagement framework is based on four core ideas:

- Institutions should know what they are doing well and what they need to improve.
- Institutions should be able to measure the extent to which they are engaged.
- Institutions should be able to tell the story of their contributions to economic development.
- Institutions must engage with external stakeholders throughout this process.

CICEP has assessment tools *(http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/economic-engagement-framework/related-resources/cicep-assessment-tools_201405.pdf)* and a New Metrics Field Guide *(http://www.aplu.org/projects-and-initiatives/economic-development-and-community-engagement/economic-engagement-framework/related-resources/cicep-new-metrics-field-guide_201405.pdf)* to help institutions discern their strengths across various characteristics of economic engagement and measure their success. CICEP has identified 20 "New Metrics" across three dimensions:

Relationships with Industry. The following metrics relate to research sponsored by industry:

- Number of grants, contracts, and sub-agreements from private-sector entities.

- Dollar value of expenditures for research sponsored by private-sector entities;
- Number of sponsored research projects, by industry sector.
- Dollar value of expenditures for sponsored research, by industry sector.
- Number of unique private-sector entities funding research grants and contracts.

The following metrics relate to human clinical trials for universities with medical, nursing, and/or pharmacy programs:

- Number of trials conducted during reporting period, by phase.
- Number of subjects participating in clinical trials.
- Dollar value of sponsored-research expenditures for/on clinical trials.
- Number of protocols approved during time period.
- Number of trials initiated during time period.

The following metrics refer to service to external clients:

- Number of organizations served;
- Number of companies provided with on-site technical services.

Developing the Regional and National Workforce. These include student employment on funded projects, student entrepreneurship, and alumni in the workforce:

- Number of students paid through externally funded grants or contracts.
- Number of entrepreneurship courses/programs (credit and non-credit).
- Number of entrepreneurship courses/programs requiring a capstone project;
- Number of student start-ups associated with courses, programs, competitions, clubs, or other university-affiliated organizations.
- Average wages of alumni living in-state.

Knowledge Incubation and Acceleration Programs. These metrics relate to the success of incubation and acceleration programs and their ability to attract external investment:

- Number of full-time equivalent employees.
- Dollar amount of (equity) capital raised by clients and graduates from investors.
- Dollar amount of funding received from federal, state, or foundation sources. state or local matching programs; or other non-private sources.

While APLU's metrics are the most comprehensive set currently being proposed,, they are limited in measuring student and faculty engagement beyond funded grants.

California State University (CSU) Economic-Impact Reports

In 2004, CSU conducted a system-wide economic-impact assessment to highlight the system's economic contributions to the state of California. In 2010, an update of that assessment was prepared to provide a current picture of the CSU's economic contributions related to workforce and the growing areas of sustainability and applied research. Both reports underscored that the system is central to California's economy and directly or indirectly impacts everyone in the state.

The value of the system is much more than just the total impact of its direct, indirect, and induced spending—the traditional "multiplier effects" created by the multiple rounds of spending triggered by new income in a region. The CSU's 23 campuses also provide tens of thousands of job-ready graduates each year who contribute significantly to California and its economy. In this assessment of the CSU's economic impact, two types of economic impacts are presented: the impacts generated by CSU-related expenditures and the impact of the earnings of CSU alumni that are attributable to their degrees. The 2010 report found that CSU-related expenditures and the enhanced earnings of its graduates:

- Generate total annual spending of $70 billion in the state.
- Support more than 485,000 jobs in the state.
- Create $4.9 billion in tax revenue for the state and local governments.

The magnitude of the CSU's economic impact on California can be compared to the state's annual investment in the university system. Every dollar the state invests in the university generates $5.43 in CSU-related expenditures. When the impact of the enhanced earnings of CSU graduates is included, the ratio rises to $23 in total spending impact for every dollar the state invests in the CSU.

The CSU's economic-impact report looks at a variety of economic measures:

- **Workforce**—the number of CSU graduates in key knowledge-based and service industries. This analysis focuses on key knowledge-based and service industries that account for nearly five million jobs in California, including agriculture,

life sciences, information technology, and hospitality and tourism. The CSU's contribution to these industries is evident when analyzing the percentage of graduates in California who receive their degrees from the CSU.

- **Entrepreneurship and innovation**—the number of proposals submitted and awards received from federal and state agencies and foundations that focus on applied-research projects.

- **Sustainability, the environment, and energy**—the number and scope of "green" initiatives, including energy efficiency, water conservation, alternative transportation, local food options, recycling/waste reduction, green outreach/community action, green building/sustainable design, and renewable energy. Most importantly, the CSU is making some promising contributions through a variety of creative system-wide initiatives to enhance the number of service-learning opportunities available to CSU students that encourage innovation and generate long-lasting impacts in communities.

Two examples in the CSU are worth noting. CSU Monterey Bay (CSUMB) is recognized as a national leader in service learning and civic engagement, while the Small Business Development Center (SBDC) at Humboldt State University (HSU) uses "service" and "performance" metrics resulting from its consulting assistance in the business community.

CSUMB remains the only two-time recipient of the U.S. President's Higher Education Community Service Award. In 2013, CSUMB received the prestigious "Higher Education Civic Engagement Award" from The Washington Center, recognizing the university's outstanding commitment to public service and community engagement. CSUMB's Service Learning Institute fosters and promotes social justice by cultivating reciprocal service and learning partnerships among CSUMB students, faculty, staff, and the surrounding tri-county communities. During the 2013-2014 academic year, 2,206 students in 83 courses provided 66,180 hours of service in 233 community agencies and schools throughout Santa Cruz, San Benito, and Monterey counties. The monetary value of this service, calculated using the Independent Sector Value of Community and Volunteer Service metric, totals $1,743,181.

The SBDC at Humboldt State provides consulting assistance to small businesses, local economic development organizations, business incubators, accelerators, and other entities to build strong local enterprises that generate living- wage jobs. The center's services include in-depth consulting on international trade, technology commercialization, and preparation of documents involving loans and equity investments.

HSU's SBDC is known for its use of metrics. The staff members gather data for their assessments directly from clients and then seek third-party verification from a professor of business. The SBDC gathers data to demonstrate its effectiveness in "service" and "performance." Although time consuming, the approach has proven to be invaluable to the center's business-development efforts. The following information then is used in its economic-impact report:

Service metrics, including:
- Number of businesses consulted
- Number of consulting hours
- Number of training events
- Number of training attendees

Performance metrics, including:
- Number of jobs created
- Number of jobs maintained
- Number of businesses started
- Dollar amount of increases in clients' sales
- Dollar amount of loans made to clients
- Dollar amount of equity investments made in clients.

The reports on CSU's economic impacts are broken down by campus, region, and specific topic/industry area. More information can be found at *http://calstate.edu/impact/state.html*.

Institutional Mission as a Driver of Metric Development

Stephen Pelletier (2014) offers some basic markers that help AASCU institutions operationalize stewardship. He states that "universities define their role in the

community in different ways—as stewards of place, for example, or as anchor institutions, urban universities, or engines of economic development." What is common to all these different approaches is that successful institutions have defined their work in the context of their mission and region. Furthermore, he adds, "the least refined aspect of operationalizing stewardship is measuring its impact."

Perhaps the best examples of how universities with a mission as an anchor institution to improve surrounding communities through community partnerships is offered by a 2012 study by Rita Axelroth Hodges and Steve Dubb. They looked at the impact of 10 very diverse institutions on community economic development. The universities in their case study played three different roles in the context of their missions and locations—as facilitators, leaders, or conveners. Those critical roles influenced an institution's engagement with the community, and in so doing, its impact on the region. Each of these roles has implications for partnership programs and goals, institutional support and leadership, funding and resources, principles of economic inclusion, the nature of community relationships, and the impact on the local region.

According to Axelroth and Dubb, facilitator universities are often large young public institutions with limited funding. These universities advance civic engagement, but opportunities for economic impact through local purchasing, hiring, investment, and real estate are limited. These institutions' regional development focuses on providing access to educational opportunity and a high-quality learning environment. Thus, methods of measuring workforce development play a key role in measuring impact for these institutions. In addition, building external relationships plays a particularly strong role in these institution's anchor strategies. Their role often is to build capacity for community organizations by providing in-kind facilities and facilitating community forums. These institutions also emphasize service-learning opportunities as well as public education and health partnerships, with large numbers of students and faculty involved. These efforts tend to reach a significant number of community partners, with the work typically dispersed throughout the greater community rather than focused on a specific neighborhood.

Universities that serve as leaders in regional development generally act in response to crises, most often urban crime or the perception of crime. Improving conditions

in their adjacent neighborhood is necessary for a cleaner, safer environment that will attract students and faculty members to the institution, and maintain the university's reputation. These universities drive the regional-development agenda, with programs often focusing on the "big three" issues—public health, K-12 education, and community development. For these institutions, community health and education outcomes play a significant role.

Universities serving as conveners make strategic choices to engage in neighborhood revitalization. For these institutions, community development is seen as part of their institutional mission within a broader engagement context. As conveners, universities view the community as a co-participant in leadership and agenda setting and give significant focus to building capabilities of the community and its residents. These institutions will emphasize metrics that capture the positive impact on the welfare of low-income residents.

Thus, a key aspect of defining and developing metrics to measure community economic development is based on institutional mission and purpose. The data points that are used to establish impact should be guided by the roles the institution seeks to play within the region.

Advice for Leadership—How to Avoid Pitfalls in Developing Metrics

In the quest to develop appropriate metrics, institutions must be careful to avoid some key mistakes. The challenge for AASCU institutions is to ensure that they select metrics that effectively communicate a university's economic contributions to internal and external constituents. Ways to avoid common pitfalls in developing metrics include:

- **Try to avoid letting local, state, or federal governments or research-intensive universities define metrics for the institution.** As the recent controversy over developing a federal framework for rating colleges indicates, "one size does not fit all." If governments and research-intensive universities are allowed to define metrics and set the agenda for regional economic-development outcomes, the contributions of comprehensive universities will be seriously undervalued. AASCU institutions are uniquely positioned to be Stewards of Place. They have a better sense of their specific impact on the regional economy and the communities served.

- **Expand notions of faculty and student contributions beyond those that involve grants and contracts (sponsored projects).** The range and scope of faculty and student contributions extends far beyond the narrow areas of research and sponsored programs and activities. AASCU institutions make an impact in multiple ways—service-learning, internships, civic engagement, volunteer activities, and entrepreneurial activity. Although some of these engagement efforts may carry no dollar value—for instance volunteer hours, civic participation, and raising social and cultural awareness in the region—they are nonetheless important to include.

- **Engage key stakeholders in helping assess regional impact.** Employers and business/industry partners must be engaged in helping measure the impact of regional-engagement efforts. Since they are often the direct beneficiaries of institutions' activities, their input, insight, and recommendations would be invaluable to helping define robust and meaningful metrics. Regional constituents ought to be consulted in advance so that the choice and quality of metrics resonate with regional and state decision-makers. In addition, their engagement in the process would strengthen advocacy by such stakeholders.

- **Consider and capture the long-term nature of university contributions on regional economic development.** It is important for institutions to remember that our contributions often extend beyond the immediate time period. For instance, the benefits of job creation, workforce preparation, and income growth accrue over time. Institutions should consider taking a composite view of their impact so that the full extent of contributions is understood.

Development of Metrics—Recommendations for University Leaders

As AASCU institutions broaden the scope of their economic-engagement activities beyond the traditional efforts of workforce development, technology transfer, and commercialization of university intellectual property, leaders will need to consider new metrics that capture their contributions to the local, regional, national, and global economies. This broadened scope to innovation, competiveness, and economic prosperity requires new ways to inform both internal and external stakeholders about the impact of universities on the regions they serve. The

following three recommendations can help spur the development of effective institution-specific metrics.

Study the region you serve and know your institution. The regional context is important in order to establish priorities for engagement and stewardship. Universities located in urban and suburban regions will need to play more of a facilitator and convener role since there are likely to be several organizations addressing the regions' economic development (Hodges and Dub, 2012). Universities in rural areas may need to play a greater leadership role with respect to setting the regional-engagement agenda. It is equally important that the institution, regardless of its location, build on the history of engagement that has been established over time. This context will be important for university leaders to consider as they map their engagement strategy. In addition, the size and scope of academic programs (baccalaureate, masters, and doctoral) will determine the assets and capacity of institutions to address the challenges and opportunities for regional stewardship.

Institutions should consider key questions such as: What are the key drivers of economic growth in the region? Which industry clusters offer the greatest potential for innovation and employment? What are the challenges to a sustainable, livable, and equitable community? What are the primary regional assets and resources? What is the nature of the business, economic, and political environment? What are the geographic and demographic characteristics of the region?

Answering these questions will enable a more comprehensive approach to understanding and developing the institution's strategic priorities for regional economic and social prosperity.

Develop a list of metrics based on institutional goals that mirror regional stewardship priorities. Previous sections of this chapter have illustrated a variety of metrics that AASCU institutions could use to convey the impact of their regional engagement. Universities should select those that seem relevant after identifying priorities for regional stewardship. For example, if improving regional health indicators is an important strategic priority, a university could select a number of metrics such as:

- The number of nursing/health science graduates per year
- APLU metrics for clinical trials
- The extent of university research into regional health disparities (grants, contracts, dissemination, etc.)
- Measures that capture contributions to public health initiatives (supporting clinics, conferences, student internships, and volunteer activities in community-health organizations, etc.).

Universities will need to consider metrics that capture the impact of contributions through:

- Students
- Faculty
- Curricula and programs
- Public-private partnerships
- Innovation, technology transfer, and intellectual property
- Community and workforce development
- Business incubation and space
- Internationalization

Pay attention to the audience for dissemination of the metric narrative. The external audience may include local, state, and federal officials and elected representatives, business leaders, industry associations, chambers of commerce, community organizations, prospective students and parents, alumni, donors, and the media. The internal stakeholders include students, faculty, and staff. The narrative associated with the metrics must be contextualized for the audience and the impact that the institution wants to emphasize.

Conclusion

AASCU institutions are naturally connected to their communities and regions. The students they serve, in large part, come from within the community and region. The jobs and careers the students enter are in the region, and the most significant research issues pursued are linked to the region. AASCU institutions rely on the political support that emanates from the region.

Metropolitan areas are recognizing that encouraging creativity and innovation is the key to regional economic prosperity. Even more important, local governments and business leaders are jointly realizing that their regions are, in fact, an interconnected economic and knowledge-based network that requires a collaborative approach to spark job creation and long-term economic growth. In this environment, regional comprehensive universities must effectively demonstrate that they serve and support their regions in many ways that are indispensable to economic prosperity. Metrics validate the universities' contributions and convey the narrative in the strongest possible terms.

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