

A Resource Guide for Technology-based
Economic Development:
Positioning Universities as Drivers
Fostering Entrepreneurship
Increasing Access to Capital



Prepared for the
ECONOMIC DEVELOPMENT ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE



ABOUT SSTI

The State Science and Technology Institute is a national nonprofit organization dedicated to improving government-industry programs that encourage economic growth through the application of science and technology.

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The statements, findings, conclusions, and recommendations are those of the authors and do not necessarily reflect the views of the Economic Development Administration or the Department of Commerce.



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Resources Guide: Introduction



Introduction

During the last several years, the U.S. economy has been undergoing a dramatic transformation as the nation moves to an economy driven by technology—through the creation of new industries and the application of technology in traditional industries. Competing in a global economy, regions must have an economic base composed of firms that constantly innovate and maximize the use of technology in the workplace. Technology-based economic development is the approach used to help create a climate where that new economic base can thrive.

Based on the experience of tech-based economies like Silicon Valley, Research Triangle, and Route 128, it is generally acknowledged now that the following elements are required for a tech-based economy:

- An intellectual infrastructure, i.e. universities and public or private research laboratories that generate new knowledge and discoveries
- Mechanisms for transferring knowledge from one individual to another or from one company to another
- Physical infrastructure that includes high quality telecommunications systems and affordable high speed Internet connections
- Highly skilled technical workforce
- Sources of risk capital
- Quality of life, and
- Entrepreneurial culture

This resource guide focuses on three of the elements – intellectual infrastructure, capital, and entrepreneurial culture – and is intended to assist economic development practitioners in their efforts to accelerate transition to technology-based economies. The decision to address these three elements within one document was deliberate because, though apparently distinct, the elements are in practice inter-related. Therefore, while readers may focus on whichever section they see as central to their own interests, they may also find benefit in reviewing the other two sections, since comments and observations found in one section often pertain as well to issues in the other sections.

Practitioners can use the guide to implement and update programs addressing these three critical elements required for a tech-based economy. The guide also begins to resolve one of the most challenging issues for the tech-based economic development community: the paucity of written information that captures the insights, wisdom and practical knowledge of people who have decades of experience in the field.

Although state efforts reach back to the 1950s, the technology-based economic development field still relies heavily on oral tradition to convey what has been learned, and as one former official put it, “I am not aware of any formal training/academic programs for the directors and associates ... except for on the job learning.” This resource guide serves as a starting point in transferring the collective knowledge of the field to a written form that will be useful not only to those new to the field, but also to those with more experience.



Resources Guide: Introduction

Developing a Practical Resource Guide

Over the years, many academic researchers, associations and private consulting firms have prepared reports, papers and studies attempting to identify “best practices” among a wide range of programs, policies or practices to encourage technology-based economic development. The utility of most studies of best practices, however, is limited by several factors. Nearly all are developed either by those with little or no actual experience in the field as practitioners or by organizations with an interest in the success of a particular approach. For the former group, the results may lead to conclusions or recommendations that have limited applicability to practical implementation for many state and local governments. The latter group risks explicit or subconscious and real or perceived biases that influence which programs or approaches are designated best practices.

Best practice publications also can be limited by the depth and breadth of the author’s knowledge of the universe of programs in the particular field. For example, the case studies for many best practices are taken from members of the association preparing the report, by scanning newspaper headlines and conference brochures, or asking a few close colleagues in the field. The best-known programs are not necessarily the most effective (unless, of course, one is exploring best practices in marketing and outreach).

With limited resources available for this project, the focus could not be on determining and evaluating with academic rigor which are the “best” practices—a report that is certainly needed, but that is more complex and expensive to produce than the available funding allowed. Rather, this document is intended to serve as a practical resource guide for several audiences:

- Practitioners new to the field—the information contained in this guide serves as a starting point in explaining various approaches that can be employed to help build a tech-based economy
- Experienced practitioners—even for those familiar with the programs and policies highlighted in this guide, there is much to be learned from the candid advice provided by the practitioners who were interviewed
- Policymakers—the guide, we believe, helps provide a framework for considering what a state or region should do in addressing three of the most critical elements of a tech-based economy
- Elected officials and the media—the guide helps explain the strategies currently being employed, along with their relative advantages and disadvantages

In designing this guide, SSTI used a variety of resources—academic research, other guides and reports on tech-based economic development, personal experiences of SSTI staff, input from the TBED community at large—but the heart of the approach was to tap the experiences of practitioners who have designed and managed successful programs. SSTI conducted extensive personal interviews with 58 TBED practitioners (see Appendix C for a list of those interviewed) from across the country—many with 25 years or more of experience in the field—to draw on their combined wisdom in designing, implementing and running programs focused on intellectual infrastructure, entrepreneurship, and capital.

The interviews were free-form in nature and the barest of interview guides was used in order to capture as much of the individuals’ experience as possible. As a result, it is important to point out broad themes and specific lessons learned were captured in the interviews. However, because of the free-form interviews, the practitioners were not asked as a group to settle differences of opinion that exist in the TBED field. The guide should not be viewed as a unanimous endorsement from the practitioners for the opinions expressed herein; rather, SSTI has attempted to report consensus opinions where consensus exists, and sometimes countering viewpoints where it does not.

When the interviews were concluded, SSTI presented its preliminary findings at three sessions of SSTI’s Eighth Annual Conference to a broader cross-section of practitioners and asked the participants a series of questions that had arisen from the interviews. The input received at those sessions helped SSTI further refine this guide.



To illustrate the types of programs that are being employed, the reader will find throughout this guide a series of examples. The information contained in the examples was drawn largely from materials provided by the programs, but any errors that may be contained therein are solely SSTI's.

Other Resources and Only a Beginning

Our hope is that this resource guide will serve as a starting point for many as they consider how to build their tech-based economy. Readers of this guide may find the following organizations and publications as useful as we do, and we encourage you to draw upon their resources and findings:

- Angel Capital Association
- Association of University Research Parks
- National Association of Seed and Venture Funds
- National Business Incubation Association
- *Angel Investment Groups, Networks, and Funds: A Guidebook to Developing the Right Angel Organization for Your Community* by Susan L. Preston (Ewing Marion Kauffman Foundation: August 2004 edition).
- *Public Involvement in Venture Capital Funds: Lessons from Three Program Alternatives* by David L. Barkley, Deborah M. Markley, and Julia Sass Rubin (Rural Policy Research Institute, RUPRI Rural Equity Capital Panel, November, 1999, Updated February 2000)
- *Venture Capital Cycle: Second Edition* by Paul Gompers and Josh Lerner (MIT Press: 2004)

Readers may also find the *SSTI Weekly Digest* a useful resource for keeping track of what is occurring in the TBED community and SSTI's tbedresourcenter.org for locating other reports on issues affecting the TBED community.

Just as this guide can be a starting point in learning more about how to build a tech-based economy, it is important to know that SSTI views it as a starting point for much work that remains to be done. Because the TBED field is evolving and the experience of practitioners is increasing, there are more interviews to be done, more lessons learned to be shared, more topics to be covered, and perhaps, most importantly, more discussion to be held on the lessons contained in this resource guide.

Acknowledgments

SSTI appreciates the support of the Economic Development Administration in preparing this guide. Our particular thanks go to John McNamee and Sunni Massey for their encouragement throughout the process.

SSTI is greatly indebted to the 58 practitioners who agreed to be interviewed for this guide. Not only were they generous with their time, but also with their willingness to share what they have learned, their candor in discussing what has worked and what has not, and their insights and advice. The field is better because of their participation in it, and we are gratified to have the trust they placed in us.

Any project produced by SSTI is truly the work of the whole team, and this guide is no different. From SSTI, Dan Berglund, Mark Skinner and Sheri Stickley, and from Battelle's Technology Partnership Practice, Marianne Clarke conducted interviews and prepared the text. Phillip Battle and Rhiannon Mehring provided critical research assistance and writing, particularly in the examples used throughout. Mark Kish did his typical masterful job in designing the report. Heidi Findley offered editing support that helped bring the document together as a cohesive whole. Noelle Sheets provided encouragement and moral support throughout the project, and Sue Bell, Robin Brunotts, Ruth Carr, and Bela Gergely provided administrative and research support throughout that made the project manageable.

Resource Guide: Universities as Drivers



Introduction

One of the most critical elements in a technology-based economy is the strength of its research and development institutions. Research and development drives technological progress and, therefore, economic growth. Capital invested in basic and applied research has led to important breakthroughs in electronics, computer science, IT, and the biosciences.

Numerous studies have shown that anchors of fast-growing, technology-oriented economies are major research universities interacting with a robust technology-oriented private sector. For example, a study prepared for the U.S. Small Business Administration (SBA) found, “Research universities and investment in R&D at these universities are major factors contributing to economic growth in the labor market areas in which the universities are situated.”¹ Studies by the U.S. Department of Commerce’s Office of Technology Policy and others have found that all areas of technology-based economic development in the U.S. have strong concentrations of both university and private research.² A Milken Institute study found that research centers and institutes are “undisputedly the most important factor in incubating high-tech industries.”³

Experience in communities throughout the U.S. bears out these research findings. In a study of growing companies in Seattle, for example, fully 70 percent of the companies had a “direct, active role in the operation of the University of Washington.”⁴ A study conducted for BankBoston⁵ assessing the impact of MIT on the economy of Massachusetts and the nation found:

- If the companies founded by MIT graduates formed an independent nation, the revenues produced by the companies would make that nation the 24th largest economy in the world. The 4,000 MIT-related companies employ 1.1 million people and have annual world sales of \$232 billion.
- The 1,065 MIT-related firms headquartered in Massachusetts employ 353,000 people worldwide and 125,000 people in the state. They generate worldwide sales of \$53 billion. These companies represent five percent of total state employment and 10 percent of the state’s economic base. MIT-related firms account for about 25 percent of sales of all manufacturing firms in the state and 33 percent of all software sales.

It is, therefore, not surprising that states and regions have historically looked to their higher education institutions to be key drivers of economic growth.

Example

Forty years ago, the University of California at San Diego (UCSD) did not exist as an operating institution. Now it is on a par with UCLA and UC-Berkeley within the University of California system—arguably the most distinguished public university organization in the world—in the size of its research programs. With major centers of excellence in the biological, engineering, and physical sciences, UCSD’s research expenditures in FY 2003 totaled \$646.5 million, placing it seventh among all U.S. universities. It boasts five Nobel prize-winning faculty members, 60 members of the National Academy of Science, and over 80 endowed professorial chairs.

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Most importantly from an economic development perspective is the ongoing and important relationship between UCSD and greater San Diego. Working through an organizational infrastructure and mission that emphasizes the university role in the regional economy, UCSD reports that more than 40,000 jobholders in the San Diego economy are now held by its graduates, many of them in the burgeoning number of high-tech companies that characterize the community.

Founded by UCSD, the nationally-known CONNECT program plays a major role in fostering the local entrepreneurial economy, involved in more than 100 events a year. Not surprisingly, the university technology transfer function places a heavy emphasis on commercializing faculty inventions through locally-based start-up companies. UCSD reported in 2004 that during the last decade, more than 70 start-ups were created using UCSD technology as the foundation and about 220 companies had been spun off from UCSD, including firms created by alumni, faculty and staff.⁶

There are a number of reasons why the presence of research universities with recognized areas of research excellence is critical for regions and states seeking to grow technology-based knowledge economies. First, the research conducted at the university generates new knowledge and technology that form the basis for creating new firms and introducing new products in the marketplace. Second, the universities both attract and produce highly trained personnel who provide the technically educated workforce needed by technologically advanced companies. The presence of such a workforce, in turn, attracts technology companies to locate in proximity to university centers. Third, universities generate intellectual property that can lead to new products and processes and the creation of new companies.

The universities that have been most effective in launching and supporting knowledge economies appear to display the following characteristics:

- **They are performing world-class research in areas that correspond to the science and technology drivers of the national and regional knowledge sectors.** Universities that are responsive to the knowledge economy often have developed centers of excellence focused on key technology areas of importance to regional industry clusters. In addition to conducting research of value to the industry, these centers enable the university to turn out significant numbers of undergraduates and graduates that provide the workforce needed by the industry.
- **They have a cadre of nationally prominent faculty.** A new paradigm has emerged that recognizes that a key to attracting research dollars and building an institution's capabilities and reputation is to attract world-class researchers. Universities that are effective generators of technology-based growth are able to recruit and retain their star researchers. In many cases, this prestige faculty holds appointments that are oriented toward both fundamental science and real world (e.g., industrial, social, cultural) applications and implications.
- **They have leadership who views the university as a key partner with industry and government in creating and growing a knowledge economy.** The university's leadership must be committed to pursuing concurrent goals of academic excellence and regional economic development and the university must have in place an organizational infrastructure and culture that enables the university and faculty to partner both internally across schools and disciplines and externally with industry and other research institutions.
- **They have the physical infrastructure needed to support research and technology development.** This includes laboratories equipped with state-of-the-art instrumentation, attractive classrooms and learning centers encompassing the best instructional technologies, university-affiliated research parks to foster partnering and interaction with industry, and conference facilities that will provide a range of venues for scholarly and business-oriented interaction.
- **They have mechanisms in place, including financing programs, to facilitate the translation of research findings into commercial products and processes.** More and more leading universities are improving technology

transfer programs and establishing commercialization assistance programs to help faculty and entrepreneurs move technology from the lab to the market.

STRATEGIES TO POSITION UNIVERSITIES TO DRIVE KNOWLEDGE-BASED ECONOMIC GROWTH

There are a variety of approaches that can be used to invest in higher education to enable the institutions to become key drivers of a tech-based economy. We focus on four approaches in this guide:

1. Building Research Excellence in Key Strategic Areas

One way in which states and regions seek to bolster the impact of universities on the local technology economy is to invest R&D funds targeted to strategic priority areas that the university can use to leverage other sources of funding. The investments are strategy-driven, and key areas are identified based on an analysis of the core competencies of both the local economy and locally-based universities.

2. Attracting and retaining a World Class Faculty

The core of academic excellence is found, over and over again, in the talents and ambitions of a relatively small number of highly productive faculty members. In effect, more than 90 percent of the most significant R&D is performed by less than 10 percent of the faculty members. This has been true since the early history of the modern university, the relationship is stable, and it was formulated as a mathematical “law” over eighty years ago.⁷ The hard part of course is to identify, nurture, and keep that small cadre of highly talented researchers. There are two basic strategies, which are not mutually exclusive. One is to pick highly talented junior faculty, and try to hold on to those who mature into world-class scientists. An alternative approach is to identify senior individuals, with established reputations and research programs, and recruit them.

3. Linking Academic Researchers and Industry

Innovation, in and of itself, will not necessarily translate into economic activity. Rather, it is the application of that technology and its introduction into the marketplace that results in economic growth. Having a strong R&D base is necessary but not sufficient to grow a technology-based economy. An effective means of moving technology into the commercial marketplace is to encourage relationships between the researchers who are making the discoveries and the entrepreneurs and companies that have the ability to commercialize them.

4. Capturing IP to Create New Companies, Products, and Processes

Universities and other research institutions find that potential market applications for research findings often go unnoticed unless funding is available to further develop an idea or approach, to conduct further applied research, undertake due diligence, or expose the research to other people with differing perspectives. Prototype development and proof-of-concept funds are used to address this need. Some universities have established independent entities to commercialize the institution’s research findings and to provide assistance, including in some cases, financial assistance, to faculty and staff who create new companies around university developed technologies. Other universities have used their endowments to capitalize local or regional seed and venture funds.

The idea of leveraging a state or region’s intellectual assets to grow a technology-based economy is not new. In fact, the early state technology-based development (TBED) programs were designed to do just that. For more than twenty years, states and regions have undertaken initiatives designed to make universities key drivers of regional economic development. Drawing on the collective experience of TBED practitioners, this section of the guide discusses the mechanisms and tools that can be used to implement the strategies outlined above suggesting which mechanisms are most effective in which cases.

Other approaches to leveraging a region’s infrastructure include investing in physical infrastructure and the development of research parks and mixed campuses. Despite the huge growth in federal support of university research during the post World War II era, federal support for infrastructure is proportionately less plentiful than project support (which is heavily weighted toward research personnel costs). There are some

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equipment grants available, but the competition is quite fierce. The upshot is that a combination of state and local government support, philanthropy, and corporate donations must fill the gap to build a physical infrastructure required for quality research programs.

Research parks are real estate developments in which land and buildings are used to house public and private research and development facilities, high technology and science-based companies, and support services. By providing a location in which researchers and companies operate in close proximity, research parks create an environment that fosters collaboration and innovation and promotes the development, transfer and commercialization of technology.

Due to space and resource limitations, the rest of this section explores only the four most common approaches and some of the lessons learned from practitioners who have worked on these programs for a number of years.

University-Industry Research Centers

Many states made significant investments to create university-industry research centers focused on topics relating to the state's key industry sectors in the early days of technology-based economic development (TBED). Such centers, often called "Centers of Excellence" or advanced technology centers, were the key centerpiece of early TBED programs in Kansas, New Jersey, New York, and Ohio. Many, if not most, of the centers created under these programs still operate today, some with continuing state support and some with alternative sources of funding but these programs have evolved significantly. Interest in university-industry research centers waned somewhat in the 1990s due in part to concerns that the centers were too dominated by academic interests and as a result were not having the economic development impact that was desired.

Today, with the growing recognition of the need to promote multi-institutional, multi-disciplinary research, interest in centers programs is again high. New York has created a new Centers of Excellence program to complement its existing Advanced Technology Centers (ATCs) and Strategically Targeted Academic Research (STAR) Centers and California created three new California Institutes of Science and Innovation in 2001. South Dakota funded three Centers of Excellence in 2004 and the North Dakota legislature committed \$50 million to create Centers of Excellence at the state's universities and colleges in 2005. Ohio, which created its Edison Centers more than 20 years ago, has now created Wright Centers that support collaborations among higher education, nonprofit research organizations and companies designed to lead to commercialization.

All of these efforts are aimed at achieving technology-based economic development by leveraging a state or region's university research strengths. The design of a university-industry research center, however, can vary significantly depending on the specific objective that a state or region is trying to achieve.

Traditionally, university research was conducted by individual investigators housed in discipline-focused departments. Within the past twenty years, however, an increasing share of the growth in university research is channeled through research centers or institutes. A research center generally includes a number of affiliated faculty members, a center director and management, graduate students, dedicated laboratory facilities, allied educational programs and in the case of university-industry centers, industrial partners. More and more, such centers also include commercialization activities.

Industry-university research centers can be organized in several ways. They can be part of the university; they can be independent but closely affiliated with a university; or, they can operate as a completely independent nonprofit organization. There are advantages and disadvantages to each approach. Centers that are part of the university have to make sure that they understand and are responsive to industry needs. Likewise independent nonprofits must understand and appreciate the academic climate in which university researchers must operate. A successful center is one in which the Center is able to bridge the gap between two very different cultures, academia and business.



University-industry research centers can be used to:

- Build a state or region's research enterprise
- Encourage academic researchers to undertake research with potential economic benefits
- Assist local companies by tapping university resources
- Encourage the commercialization of university-developed discoveries

In a state or region that is seeking to grow its research base, creating a center of excellence can help to attract faculty and increased federal and private R&D funding, but it should be recognized that growing the research enterprise will not necessarily, in and of itself, lead to economic benefit. Capitalizing on the research base requires that attention be paid to commercializing research findings as well.

One state's centers, for example, were designed to both build capacity of the state's research institutions by attracting world-class researchers while at the same time developing collaborative industrial academic partnerships. But in the opinion of practitioners from that state who were interviewed for this guide the state's experience was that they were more successful at achieving the former rather than the latter. Similarly, practitioners in another state whose center program was specifically designed to build linkages between the state's research universities, which already had significant capacity, and local industry reported that leveraging university strengths into new technologies and companies proved to be quite a challenge.

KEY FEATURES

Industry-university research centers share some common characteristics although there are alternative models that reflect local conditions and objectives. Key features of university-industry centers include:

1. Industry Participation

The level of industry involvement in university industry research centers can vary from industry providing financial support and serving on industrial advisory boards (industrial affiliate model) to industry holding the majority of seats on a Board of Directors and driving the direction of the center. Industries participate in centers to gain access to cutting-edge researchers and equipment and to find talented graduate students.

2. Requirements for Matching Support

Practitioners advised that a true test of whether a center has the support of industry is the level of match that the Center is able to raise. The early centers usually required a 1:1 match of private to public money. Today, centers are often required to raise three to four dollars for every dollar of public money invested, and while this might be the minimum requirement, successful centers are often able to achieve much higher leverage ratios, particularly if federal funds are also taken into account.

Requiring cash match is an essential component of successful centers. Early centers that allowed companies to provide in-kind match often found that the centers were then underfunded, some practitioners reported. However, there is a balancing act in requiring cash match and assisting smaller companies. Smaller companies have more difficulty in providing cash match, so unless provisions are made to encourage the center to work with small companies, centers may opt to focus only on large companies that can provide the cash match. A few practitioners suggested that other means of encouraging university-industry collaboration, such as matching grant programs rather than centers, may be more appropriate for working with small and medium-size enterprises, although policymakers should seriously consider the economic and political implications of focusing on multi-million-dollar investments that work with a limited number of large companies.

3. Focus on Specific areas of Technology

One of the primary reasons that states and regions provide support for research centers is that they focus on specific areas of technology that offer potential for economic development either because they address areas of importance to the state or region's existing industry base or because they are emerging areas that

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offer the opportunity to develop new companies and industries.

State and regions have taken two approaches to identifying strategic technology areas in which to create university-industry research centers. The first approach is to identify the research strengths or core competencies of the state or region's research institutions and to analyze its economic base to identify those niches that will offer the greatest opportunities for development in the state or region. The second approach is to issue a competitive RFP and let the universities and industry come together to propose areas of focus.

Some practitioners advised that the RFP process can be very useful if the goal is to support existing industry — it is market-driven and forces the partnership to be tangible with money on the table before the public dollars are added. However, if the goal is to pick an emerging industry and nurture it, then you have to identify strategic focus areas because there may be no existing industry base. Some practitioners cautioned that if picking an emerging industry, then care should be given as to the plan for how to support the growth of that industry beyond funding research that supports it.

4. Multi-disciplinary in Nature

Another reason for creating centers and the reason why so much of the growth in university research is being channeled through centers is that centers facilitate multi-disciplinary research, which is increasingly gaining importance in driving new study areas, technology and commercializable innovations and discoveries. Many argue it is in the convergence of previously distinct fields that the greatest advances are being made. Advanced information technology, for example, have given biologists the ability to manipulate very large-scale data sets. Nanotechnology is being used to design and fabricate extremely small information processing and mechanical devices. Harnessing such new technologies and finding applications for them in new markets offers great potential for spinning off new companies and products.

5. Focus on Commercialization

One of the lessons learned from early university-industry centers is that building the research base, while a prerequisite, does not automatically result in commercialization. More and more centers include staff who can provide commercialization assistance, in terms of both financing and business support to researchers.

KEY SUCCESS FACTORS

Individuals with experience in designing, managing and operating university-industry research center programs were interviewed to get their input on the factors that they feel are key to developing centers that will result in significant economic development and to ask what advice they would give to someone creating or operating a centers program today. The following are the key factors that were identified.

1. Peer Review of Proposals

Program managers emphasized the importance of awarding centers on a competitive basis by using peer reviewers. This ensures that first and foremost the public sector is supporting good science and insulates the selection process from politics to the extent that it can be. Some states make it a point to use out-of-state reviewers, others use a mix of in-state and out-of-state reviewers. Review teams should include individuals with both academic and industrial experience.

2. The Director and Quality of the Faculty

A characteristic shared by successful centers is that they were started by or recruited high quality researchers who were able to attract R&D funding from multiple sources. Not only were they good researchers, however, they were also people willing to interact with the industrial community. Faculty in successful centers are committed to both economic relevance and academic excellence.

Program managers also indicated that it takes a unique individual to run a center. The most effective Center Directors are those who are 1) entrepreneurial, 2) credible and recognized among the faculty and thereby able to attract faculty



to participate in the center, 3) recognized by the administration, and 4) able to inspire the confidence of industry. Of these attributes, being entrepreneurial is probably most important in terms of having a center that leads to economic development. One practitioner put it this way, "The key factor to a center's success is the technical management of the center. That is the center's director who, in fact, has experience, maturity, and the respect of people in his or her field, and the vision of where the technology or the science and skill needs to go into the future, and how it relates to industry."

3. Commitment and Involvement of Senior Industry Leaders

Successful centers are driven by industry needs rather than the desire of scientists to explore basic research. This is what differentiates a university-industry center from a basic academic research center. Industry needs to play a leadership role if the center is going to succeed in commercializing new innovations and realizing the economic development impacts that are desired. Practitioners cautioned it is important that centers enlist the participation of very senior people from its corporate partners who are committed to participation and are prepared to drive it. One former program director indicated that the industry people who served on their advisory committees tended to be people with technical expertise. As a result, the centers became too focused on the research side rather than the business side. The involvement of more senior corporate officers would help maintain a focus on the potential for economic development. A center director indicated that the biggest mistake to make is to become too preoccupied with the research and technology and not sufficiently focused on what industry trends are and what the technology needs are within an industry.

4. Periodic review of centers

Some program managers interviewed suggested that programs to support university-industry research centers should define funding for a specified period of time, at which point a decision could be made as to whether to renew funding for the center or not. Some of the early programs did not begin with an expectation that centers would graduate or over time reduce their need for state support, making it more difficult to end public support for the centers. It should be noted that establishing advanced research centers or centers of excellence requires a long-term commitment, and that providing funding for an extended period of time should be expected. Funding has to be available to get the center up and operating and staffed with researchers who are then able to bring in funding from other sources. Such funding should not, however, be considered an entitlement. The expectation that a center will continue to receive annual support can make it difficult to discontinue funding for non-performing centers and also limits a state's ability to use program funds to create new centers.

Centers should be periodically reviewed so that funding can be cut if the results are not good, if the results are not relevant anymore or, in some cases, even if the results are very good but state support is no longer needed. The downside of completely phasing out all state support is that the center then may not have as much of an incentive to work with in-state companies or to commercialize research findings within the state.

5. Accountability Requirements

Centers must be held accountable, but at the same time they must be given flexibility as they are getting started. A common approach is to ask each center director and center team to develop a model for how they are going to be successful, and to identify the steps or milestones that would have to be achieved to succeed in accomplishing their vision for the center. The program administrators then measured each center's progress against the agreed upon milestones. One program administrator said, "Regular evaluations are important and we found that site visits were absolutely essential." Many programs bring in external review panels that often include out-of-state reviewers.

RESOURCES REQUIRED AND SOURCES OF FUNDS

The budgets of center initiatives can vary greatly. Those that provide support for buildings and equipment often require millions of dollars, ones that provide operating support may be considerably smaller. The State of Ohio, for example,

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recently competitively awarded funds to create Wright Centers of Innovation, which represent partnerships of Ohio research institutions and industry. Each Center received between \$10 million and \$20 million, which can be used to support the construction and refurbishing of research and commercialization facilities as well as for operating support. While centers are often started with state funding and private sector funding, successful centers compete effectively for federal awards.

CONSIDERATIONS IN CHOOSING THIS APPROACH

Creating a center of excellence is an expensive proposition that requires a significant cash investment. For states or regions with limited resources, it may make more sense to use scarce resources to provide matching grants for university-industry projects or to leverage federal dollars. At the same time, creating centers of excellence can play an important role in developing strong R&D capabilities and partnerships in areas of significance to the state or region's economic future or developing new industries based on emerging technologies. Other alternatives to funding centers are to attract world-class researchers with the ability to grow centers of excellence or supporting junior faculty as they build their research programs. The next section discusses Eminent Scholars programs that focus on attracting research talent.

Example

New York's Centers for Advanced Technology (CATs) support commercialization partnerships between universities and private firms by providing university space for basic and applied research, and for planning the transfer of new technologies into high-tech markets. Since 1983 the state has designated CATs in targeted technology areas, including integrated electronics, optics, biotechnology, telecommunications, robotics and automation, imaging, and nanotechnology.⁸

Centers may apply for the designation once they have demonstrated a capacity for successful collaboration with industry partners, a willingness to cooperate with other state institutions of higher education and economic development agencies, and the ability to secure outside funding that can match or exceed the state's contribution. CATs receive up to \$1 million in their first year of funding, and may retain the designation for up to ten years with increasing requirements for outside funds, and a maximum of \$500,000 from the state in its tenth year.⁹ In 1999, the state legislature established the Enhanced Centers of Advances Technology (E-CAT) program, which makes additional funds available if a center demonstrates that funding is needed to secure outside investment or when the research being done at a center has unusual potential for economic development.¹⁰

As of 2006, 15 designated CATs are in operation at 13 New York universities. NYSTAR's annual report for FY 2004-2005 reports that almost \$24 million in matching funds were leveraged in that year by the state's \$12.5 million investment in the program. The program office also reports that the centers were responsible for 383 new jobs created at client companies.¹¹

Eminent Scholars Programs

It is becoming increasingly common for states to try to build their research base by providing their universities with the means to attract world-class faculty, often referred to as Eminent Scholars. During the early-1980s, the University of Texas was able to fill 32 endowed positions in engineering and the natural sciences, with an emphasis on areas such as microelectronics, material sciences, physics, and computer sciences. Many have argued that this was a major contributor to attracting the Microelectronic and Computer Technology Corporation (MCC) and Sematech to Austin, Texas and to the rapid subsequent growth of its high technology regional economy. More recently, Georgia and Kentucky have achieved success in building their R&D bases through Eminent Scholars programs.

Eminent Scholars programs provide funding for endowed chairs, i.e. a position is endowed via a significant up-front investment and the income from the endowing investment is used to pay the salary of the Eminent Scholar, as well as other associated expenses. The current cost to endow a position ranges between \$3



million and \$6 million. This will cover all or most of the incumbent's salary, some "start-up" costs to outfit a laboratory, and possibly some research assistant positions. It should be realized that this is typically a one-time investment (with subsequent upgrades), that can return anywhere between \$5 million and \$20 million in research funding over a ten year period. This is truly the investment that "keeps on giving." Moreover, a cluster of such appointments can provide an important stimulus to building a regional knowledge economy.

An Eminent Scholars program is designed to increase the R&D dollars that are flowing into a state by recruiting faculty that have an excellent track record of successfully competing for R&D awards. This mechanism, therefore, is most appropriate for states or regions that have a less developed R&D base. An Eminent Scholars program will not, in and of itself, necessarily lead to economic benefit, although the work of some Eminent Scholars may lead to spin-off companies. Eminent Scholar programs are usually undertaken as part of a larger, more comprehensive effort to leverage universities as an asset for economic development.

As noted previously, there are two basic strategies, which are not mutually exclusive, in approaching eminent scholars programs. One is to pick highly talented junior faculty, and try to hold on to those who mature into world-class scientists. An alternative approach is to identify senior individuals, with established reputations and research programs, and recruit them. From the perspective of a state or region trying to help kick-start academic centers of excellence in their universities, the former approach has problems. It will typically take years before junior faculty—despite the excellence of their credentials—can play a visible, leadership role in major R&D centers. Creating other difficulties in selling the approach is that often the development period extends beyond a state political administration's time in office.

The advantages of going for established name scientists are several, from the perspectives of both the institution and the public sector. For one, the established researcher can hit the ground running, and unless operating in pre-retirement mode, he/she can be expected to bring in millions of research dollars over the course of a career. If the recruitment of an established academic star can be steered toward research areas that reflect the priorities of a state or region's plan or vision, with selection criteria favoring industrial experience, all the more attractive for the state.

The recruitment of one researcher in North Carolina demonstrates the potential impact of this approach. Wake Forest University recruited a researcher and his 20 person research team from Harvard to build both human organs and related companies in Winston-Salem. During his first year at Wake Forest, he tripled the size of his research team, attracted two companies from the Northeast to Winston-Salem, and filed 15 patent applications.

KEY SUCCESS FACTORS

Practitioners interviewed on eminent scholars programs suggest that there are two keys to success. The first is to recruit the right type of person. If the ultimate goal of an Eminent Scholars program is technology-based economic development, then in addition to being a world-class researcher considered to be in the top of his or her field, the eminent scholars must have a desire to see their discoveries commercialized, either by them or by someone else. The Georgia Research Alliance's (GRA) Eminent Scholars program has been in place since 1992 and is considered a model program that has achieved considerable success. Over the years, GRA has developed the following criteria for selecting Eminent Scholars:

- Eligible at the rank of professor
- Grant productivity – faculty recruited as eminent scholars should be expected to generate \$1 million or more in R&D awards over a couple of years or be able to bring in a major grant for a center or other major effort
- Well respected in their field and broadly cited in the literature over a sustained period
- Working in a field in which there is general consensus that the field will be strong for the next several years
- Demonstrate potential for developing a large-scale, comprehensive, well-funded interdisciplinary center
- Have a track record of building teams and mentoring others rather than acting

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- primarily in the capacity of an individual investigator
- Exhibit characteristics that suggest they can interact at a high level with not only academics but with industry and government as well
- Have an interest in entrepreneurship, which can mean being entrepreneurial in terms of creating his or her own company or willing to work with entrepreneurs or companies interested in commercializing a new technology or discovery

The second key is to be able to provide funding for the infrastructure – the labs and equipment – that will be needed to support the Eminent Scholar’s research team. One of the most important pieces of a recruitment package is the commitment to construct a laboratory or secure a new sophisticated piece of equipment for the researcher being recruited. The ability to provide such infrastructure must go hand-in-hand along with the endowed chair in order to attract an eminent scholar. In Kentucky, the first \$20 million appropriation to the state’s Research Challenge Trust Fund, also known as Bucks for Brains, was used to purchase research equipment. It was only after this investment that a second appropriation of \$110 million was used to recruit faculty.

Another factor that is important in realizing economic development outcomes from an eminent scholars program is that it should target specific areas of depth and try to build on previous investments. Recruiting a number of key research faculty in a particular area will help to build critical mass and is much more likely to result in the growth and attraction of new companies.

Example

The **Georgia Research Alliance** is a private, non-profit corporation, governed by a Board of Trustees comprised of university presidents and representatives from businesses throughout Georgia. In 1990, the Board was formed with twelve industry representatives and six university presidents; currently, the twenty-five member Board includes the six university Presidents and nineteen business representatives. The six Georgia research universities involved in the GRA are Clark Atlanta University, Emory University, the Georgia Institute of Technology, Georgia State University, the Medical College of Georgia, and the University of Georgia.

GRA fosters technology-based economic development in Georgia by recruiting enterprising scientists, sparking initiatives that have strong economic potential, and brokering partnerships between universities and with companies.

The centerpiece of GRA is its Eminent Scholar Endowment Program, which seeks to recruit prominent scholars to Georgia from around the world. Since the program was initiated, GRA has created more than 50 Eminent Scholar positions. Universities and the state of Georgia share the cost of funding Eminent Scholar positions. A permanent endowment of \$1.5 million, \$750,000 provided by the state and \$750,000 provided by the university, is created for each position. The Eminent Scholar can use the income generated by the Endowment as he or she wishes. The University is responsible for creating and funding a salaried position for the scholar, and adding additional support positions, e.g., assistant professors, post-doctoral and graduate positions, to support the scholar. In addition to providing the permanent endowment, GRA provides significant other support to attract the Eminent Scholar. This might include start-up money or a commitment to build and equip a state-of-the-art laboratory. GRA staff report that the ability to provide new research facilities and specialized equipment has been key to attracting world-class scholars to Georgia. Areas of research focus of GRA’s Eminent Scholars are primarily in advanced communications and computing and the biosciences and range from optical systems to vaccine development.

Two other programs central to the GRA model are its investments in Centers of Research Excellence and in commercialization programs. To date, GRA has been instrumental in creating some 15 such centers, primarily by providing matching funds to attract the federal grants that are the foundation for the centers’ research programs. Many of the centers are led



by GRA Eminent Scholars. GRA commercialization programs cover the full continuum of the commercialization process from identifying university technologies with commercial potential to supporting university/industry collaborations to develop and deploy the technologies.

These investments have attracted \$2 billion in new federal and private funding to the state. In addition, more than 125 companies have been created based on university-developed technologies.

Example

Kentucky's Research Challenge Trust Fund

In 1997, the Kentucky legislature passed the Kentucky Postsecondary Education Improvement Act, which created the Research Challenge Trust Fund. The program, administered by the Council on Post-secondary Education, provides funds for Kentucky's universities for efforts to attract and retain renowned faculty and researchers. The legislature has appropriated \$350 million over six years to the fund. These dollars must be matched on a 1:1 basis with private contributions.

The short-term goals of the program are to grow the universities' endowments and increase the number of endowed chairs and professorships, and generate increases in externally sponsored research. Longer-term goals are to stimulate business and job creation and to stimulate the transition to a knowledge-based economy. The program requires that 70 percent of all funds be targeted to the following five areas:

- Human health and development
- Biosciences
- Materials science and advanced manufacturing
- Information technology and communications
- Environmental and energy technologies.

Since inception, 111 endowed chairs and 176 endowed professorships have been created and the market value of the universities' research endowment has increased by 94 percent growing from \$453.5 million to \$877.9 million. Extramural R&D has increased by 76 percent from \$105.2 to \$185 million.¹³

RESOURCES REQUIRED

Building the university R&D base takes a significant level of investment. GRA has invested \$400 million in people, labs and equipment since 1992 using a mix of sources including the state lottery, the state's tobacco settlement fund, university funds, and private sources. The Kentucky legislature appropriated \$350 million over several years in the Research Challenge Trust Fund.

CONSIDERATIONS IN CHOOSING THIS APPROACH

An investment in a well-funded, world-class researcher can be an effective way in which to quickly build a university's R&D portfolio and if the scholars are chosen, in part, because they are entrepreneurial and are working in areas targeted for development within a region or state, they will be more likely to make discoveries and spin off technologies that can be commercialized locally and thereby contribute to economic development. An alternative point of view, however, would be that more would be gained from investing much smaller amounts of money to support a large number of junior faculty who may become tomorrow's superstars. Also of concern is the possibility that another university will offer an Eminent Scholar an even more attractive package to move. The recruitment of research and entrepreneurial talent could also make recruitment packages more and more costly.

Industry-University Matching Grants

The prior approaches of university-industry research centers and Eminent Scholars programs are designed to build a state or region's R&D base, but building the base is only the first step. For long-term economic development to result, mechanisms have to be put in place that encourage and support commercialization. One way to grow a technology-based economy is to build sustained relationships between a state or region's technology companies and its research institutions. Finding ways to link needs of firms, expertise of research faculty, and undertaking collaborative research,

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translational research and applications can benefit faculty interested in seeing their ideas developed and firms needing new ideas and concepts to build their companies. For the state and its citizens, this represents a way for its higher education investment to be accessible and beneficial to its industry.

A means of fostering greater university and industry interaction is to provide matching grants for research partnerships. Such programs help build relationships between academic researchers and companies and provide support for activities that help to move technology to the point at which private investment capital can be obtained.

Most matching grant programs solicit applications on a competitive basis and make awards to projects that are both technically sound and likely to have a positive economic development impact. The programs require that the company share the cost of the research project, which is typically conducted by faculty and students on behalf of the company. The level of cost share can vary; some programs vary the matching requirement based on the size of the company. TBED organizations often play an important matchmaking role, helping companies identify faculty with both the expertise that is needed to address the research problem and a willingness to partner with businesses.

Matching grant programs are designed to facilitate interactions between university researchers and the product development staff in technology-based companies. Collaborative university- industry research projects are designed to

- Enable companies to leverage their R&D funding and gain access to faculty expertise and specialized equipment
- Allow faculty and students to engage in commercially relevant research and provide real world experience for students
- Permit companies to engage with student researchers who provide a source of future talent

SSTI interviewed individuals with experience in designing, managing and operating industry-university matching grant programs to get their input on the factors that they feel are key to success and to ask what advice they would give to someone creating or operating a program today. The practitioners identified two factors, in particular.

One key to a successful program is being able to match companies with the right faculty member. Companies may know what research problem they need addressed but they often do not know how to find a university researcher with the appropriate capabilities. Serving in this matchmaking capacity is an important role for the staff administering the grant program. It should also be recognized that not every faculty member is interested in conducting applied research projects for industry clients. It is critical to find those that are interested in collaborating with companies and in providing real world experiences for students.

Another factor of success is that funding needs to be sufficient to attract the attention of faculty members. Faculty will not be interested in writing proposals for very small projects, particularly if they can get larger amounts of funding from other sources. One program director indicated that he felt that grants must be a minimum of \$40,000 to \$50,000, with the expectation of additional funding of up to \$250,000 to get the attention of faculty.

Example

Maryland Industrial Partnerships Program provides matching funds for university-based research projects that help companies develop new products. MIPS funds projects initiated by companies to meet their own needs. The projects are conducted by researchers at one of 13 University of Maryland System institutions. The program is managed by the Maryland Technology Enterprise Institute, a unit of the University of Maryland-College Park's School of Engineering. This unit manages the university's programs to encourage entrepreneurship, commercialization and new firm creation.

MIPS staff help companies find appropriate faculty with whom to partner. MIPS funds are awarded on a competitive basis with two funding cycles



annually. Applications are initially screened by MIPS staff members, then they are rated on their technical merits by a group of people with expertise in the particular subject area of the proposal. Next, a small group of business experts evaluates the business, cost and likely economic development impact of the project. Using these reviews, an evaluation board recommends projects for funding. The most important criteria in selecting projects are technical feasibility and economic development impact.

Large and small companies can receive a maximum annual award of \$100,000. Start-up companies can receive up to \$70,000. A start-up company is defined as a new company in product development mode that has been in business less than four years, has had no public offering, annual sales of less than \$1 million and at least one but no more than 12 full-time employees. The level of match required depends on the size of the company. Large companies (more than 1,000 employees) must provide 75 percent of the cost of the project, medium-sized companies (100 – 1,000) must provide 50 percent, small companies (up to 100) 35 percent and start-ups (up to 10) must provide 10 percent of total project costs. Start-ups can make an equity contribution in lieu of cash.

MIPS estimates that every MIPS dollar invested has leveraged another \$5.¹⁴

Example

The Washington Technology Center (WTC) is a statewide economic development agency focused on technology and innovation. WTC manages the **Research and Technology Development Grant Program** that awards funds for university-industry applied research projects. The company, which must cover a percentage of the cost of the project, identifies a research challenge and WTC helps to identify a researcher at one of the state's universities or non-profit research institutions that have the capability to conduct the research.

The grants are awarded on a competitive basis. The company submits a \$250 application fee along with some general information, and WTC staff works with the project researcher to gather data to validate the market. The application must include a business and commercialization plan describing the company, the market and the anticipated economic impact of the project, a project description, a milestone chart and a budget. The application receives a business and technical review from one of three WTC standing committees. A subcommittee of the WTC Board works with WTC staff to determine which proposals will be funded and a subcommittee of the WTC Board authorizes the funding.

The criteria used to evaluate projects measures economic impact, commercial merit and technical merit. Projects most likely to receive funding are those that present a strong business case, show a high level of industry-university interaction and are likely to result in positive economic benefits for the state of Washington.

Projects are funded in increments of \$100,000 and can be up to a total of \$300,000. Companies are required to provide 20 percent of the WTC investment in Phase I. In Phase II and III the amount of match is scaled to the size of the company, with companies having more than 250 employees required to provide 100 percent match while companies with 1-10 employees only need to provide 20 percent cash match. Mid-size companies provide either 35 percent (11-100 employees) or 50 percent (101-250 employees) cash match.

WTC has tracked the dollars leveraged as a result of the program and reports that since 1995, the program has leveraged \$11 for every \$1 of state money invested for a total of more than \$320 million.¹⁵

RESOURCES REQUIRED AND SOURCE OF FUNDS

Most university-industry matching grant programs are funded by state appropriations, although such programs could also be funded by local governments,

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foundations and universities. Most annual budgets for university-industry matching grants are in the \$1 million to \$1.5 million range, although the program managers interviewed indicated that a budget in the range of \$5 million to \$10 million annually would be preferable. Many of these programs have been in place for a long-time and the program budgets have not been increased to keep up with the cost of doing research.

CONSIDERATIONS IN CHOOSING THIS APPROACH

The key objective of industry-university matching grant programs is to build relationships between industry and university researchers. Such programs are effective only if they are able to provide companies with an entree to the university and help them find the faculty with the expertise and facilities that they require. It must be recognized, however, that this is a long-term process and it may be many years before outcomes translate into significant economic activity. It can also be difficult to measure outcomes in terms of economic benefit, although testimonials and success stories can be very effective in building support for a program. Lastly, as with any incentive program, care must be taken to ensure that public dollars are not being spent to subsidize research that would have occurred anyway without the matching funds.

University Technology Commercialization Programs

As discussed earlier, universities and other research institutions that are generating new knowledge and discoveries can be extremely important contributors in developing a region's technology-based economy. But, while a necessary ingredient, it is not sufficient. For a state or region to capitalize on the presence of such "technology generators," there must be mechanisms that move innovation into the marketplace. This is not something that happens naturally or easily for a number of reasons.

First, university-developed technologies often require that additional work be conducted to determine whether the technology has commercial potential, but there is little funding available for such proof-of-concept activities. In most regions of the country, it is difficult to find funding to advance the commercialization of technology owned by universities. To commercialize institutionally owned-IP at the highest value—and sometimes to license it at all—it is commonly necessary to perform additional studies, sometimes involving animal trials or, in the case of engineering discoveries, a working prototype. Often, it is also necessary to surround the original discovery with additional patents and protections. This kind of work is usually conducted by faculty members (although sometimes by outside consultants) but at the direction of the professional staff in the university licensing office. It is almost never fundable through conventional, peer-reviewed federal programs and, if it is to take place at all, it must be separately funded under a different set of criteria focused mainly on economic development.

Second, even if commercial potential can be demonstrated, investors and customers are often unwilling to assume the risk that is associated with new technology and small businesses, which are often the most innovative, generally lack the financial resources necessary to identify and promote new technologies.

Third, academic researchers often do not understand the marketplace and therefore do not know what commercial potential exists for their discoveries.

Ever since the passage of the Bayh-Dole Act of 1980 that allowed universities to own patents arising from federally-supported R&D, universities have struggled with how best to transfer university-generated technology to businesses that can commercialize it. Traditionally, universities have used licensing to accomplish this. Today, more and more universities are becoming more directly involved in commercialization taking an active role in seeking out entrepreneurs and companies as partners and, in some cases, spinning off new companies. University commercialization offices and free-standing commercialization centers have been created to assist in this process.

Technology commercialization programs help researchers and entrepreneurs to transform ideas or innovations into products ready for manufacture, marketing and distribution. Such programs assist inventors and entrepreneurs with patent



applications, engineering and testing and development of business and marketing plans. They link entrepreneurs with sources of business and management expertise and help them access capital by linking firms with sources of risk capital, including both angel investors and venture capital funds, or by providing capital directly. Programs focused on entrepreneurs and start-ups are described in more detail in the entrepreneurship section of this report.

Commercialization programs vary in how they are structured, the service they offer, the technologies they target, and how they are funded. Such programs may operate as a unit of a university but increasingly universities are creating free-standing commercialization center that seek to create start-up companies around university-developed technologies. The University of Illinois, for example, created a wholly-owned commercialization company, Illinois Ventures LLC, to work with campus technology transfer offices, faculty and outside entrepreneurs to create start-up companies to which the university can license intellectual property.

It has become increasingly common for technology commercialization programs to operate funds that provide small amounts of very early-stage proof-of-concept activities. Such commercialization funds make awards ranging from \$50,000 to \$250,000. These funds are used to undertake due diligence to determine whether there is any commercial value. In some cases, the researcher may be provided small additional funds to further refine the “proof of concept” of the research. If value is discovered, then university IP procedures will come into play. The intent of this type of fund is to discover additional commercial opportunities unforeseen by the researcher who is untrained in examining market opportunities. The end result of a technology commercialization award will be a prototype, further research that helps determine market value, or other deliverables. Some commercialization programs also provide pre-seed or seed funding to start-up companies.

The objective of university commercialization programs is to identify university-developed technologies with commercial potential and develop that technology to the point at which a commercial partner can be found or a company created to market it. The goal is to advance ideas beyond proof-of-concept thus reducing risk for investors and customers. These programs often include commercialization funds that seek to address the capital gap between basic science, which is most often funded by the federal government, and the development of technology with commercial potential.

KEY SUCCESS FACTORS

Managers of commercialization programs say that having sources of flexible funding is a key factor in being able to move technology into the market place. As discussed above, there are few, if any, sources of very early-stage funding to assess the commercial potential of a new discovery. A small amount of funding, that does not require a repayment, is needed to conduct testing, to validate the technology and to determine whether it meets a market need at a competitive price.

A second critical factor in the success of commercialization programs is their ability to connect university inventors with investors and commercial partners. Managers of commercialization programs report that their primary role, and the factor that will determine how successful they will be, is their ability to make connections: connecting researchers with promising technology with the entrepreneurs who have the ability to commercialize it; then connecting those entrepreneurs with sources of capital.

A final factor that centers like the Deshpande Center at MIT have identified as critical to successful commercialization is the ability to tie research to market needs. Encouraging interactions between university researchers and industry can help to ensure that researchers are aware of both developments in the marketplace and the technological challenges facing specific industries. If this knowledge drives their research, it is much more likely to lead to discoveries with commercial potential.

Example:

MIT's Deshpande Center for Technological Innovation was created to bridge the gap between ideas and implementation. The center, founded with a \$20 million gift from an alumnus, focuses on getting established industry engaged with researchers so that research is conducted that addresses

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market needs, provides funding and support to explore new ideas and develop them into new technologies, and links university researchers with investors and commercial partners.

The center provides a variety of types of funding: Ignition grants of up to \$50,000 are used to fund projects focused on novel, enabling, potentially useful ideas in any technology area; Innovation Grants of up to \$250,000 fund projects that have already established proof-of-concept, identified an R&D path and have developed an IP strategy. The funds are used to put together a package that can be taken to a venture capitalist or company to convince them to invest in the technology. The center's i-Teams program, a collaboration of the center, the MIT Entrepreneurship Center, and MIT Venture Capital and Private Equity Club, matches graduate students with grant recipients and business mentors. The students assist the grant recipients in assessing commercial prospects of a technology and identifying product markets.

The center uses a variety of mechanisms to encourage interaction between companies and university researchers including workshops and forums. Ignition Forums, for example, bring in industry to discuss market opportunities and challenges in particular technology areas. These are used to inform faculty and researchers of what is of interest to the industrial community and to identify potential research needs.

The center's Catalyst Program makes use of a group of individuals with experience relevant to innovation, technology, commercialization and entrepreneurship. These experienced business people participate in networking events, provide coaching for faculty entrepreneurs and serve as advisors to the center. They also participate on grant review teams.

The center also seeks to educate faculty on commercialization and entrepreneurship by holding workshops on topics such as managing faculty member's roles in start-ups, when to seek angel investors and how to split equity.¹⁶

RESOURCES REQUIRED AND SOURCE OF FUNDS

University commercialization programs can be funded by a variety of sources, including internal university resources, university foundations, state appropriations and philanthropic contributions. Budgets for commercialization programs vary greatly depending, in part, on whether the program makes direct investments in start-up companies. Definitive information on the budgets of these programs is not currently available, however, two points of reference may be useful: the Deshpande Center was created with a \$20 million gift, while in Michigan, the state legislature awarded the Western Michigan University \$10 million to operate a Bioscience Commercialization Center.

CONSIDERATIONS IN CHOOSING THIS APPROACH

Technology commercialization programs operate at the high-risk end of the spectrum. They seek to identify technology with commercial potential and to facilitate its transition into the marketplace. They work with researchers and entrepreneurs prior to company formation. As such, they will usually require a periodic infusion of funding. The majority of technology commercialization awards are grants that do not require any type of payback although some of the funds do require a repayment if a project is successful, usually in the form of a royalty. As a result, such funds often require annual appropriations.

It is also important to ensure that funds are used for commercialization activities not just to continue ongoing research projects.

Conclusion

Universities are important contributors to technology-based economies. They not only generate new discoveries but they provide the talent needed to drive a technology-based economy. But it must be recognized that promoting economic development is not the primary role of universities. Their primary roles are to



educate students and produce new knowledge. Efforts to leverage universities to build technology-based economies must recognize and respect this.

At the same time, getting universities involved in technology-based economic development can help ensure that discoveries are used to make people's lives better. It can also provide real-world experiences for faculty and students alike. Much has been learned over the last two decades about how to make university-industry partnerships work. Practitioners who have worked hard to make these partnerships work provide these words of advice:

- **Build on your strengths.** It is important that each state or region examine its university and industry strengths and build on them. Not all areas are alike in TBED and it is the differences that can be most important. Identifying strategic areas in which a state or region can be "excellent" can be a key to success.
- **Find champions.** Support from university administrators at the highest levels is critical, but it is also important to develop support from within the faculty. It is equally important to enlist the participation of senior managers from the private sector. Bring together the top people in industry, academe and S&T fields to provide a legitimate basis for planning for the future.
- **Focus on market opportunities.** It is much easier to pull technology out of universities because it meets a market need than to try to push technology out of the lab. Becoming too preoccupied with research and technology and losing sight of industry needs can result in interesting research, but no economic impact.
- **Make funding decisions based on excellence, not politics.** To have an economic impact, these programs must be based on the reality of the institution's research strengths and the economic profile of the region. Selecting funding recipients to focus on particular technology areas, industries, research institutions, or geographic areas because of political pressures, rather than on excellence, is likely to result in failure.
- **Communicate and publicize your success.** Programs that seek to capitalize on university research findings are a long-term undertaking. It is important to work with elected officials so that they understand that this is a long-term process that will require sustained support. Publicizing successes helps to not only build support among key constituents, but also attracts both faculty and industry to participate in partnership activities.
- **Recognize that there will be failure.** Commercializing innovative technologies is a risky business. As difficult as it may be, stakeholders must understand that technologies may not pan out and start-up companies may fail. Educate elected officials to understand that these are long-term investments and their impact should be measured in return on investment, not jobs created.

¹BJK Associates, *The Influence of R&D Expenditures on New Firm Formation and Economic Growth* (Maplewood, N.J.: BJK Associates, 2002), p. 1.

²See, for example, the U.S. Department of Commerce, Office of Technology Policy's *The Dynamics of Technology-based Economic Development: State Science and Technology Indicators* reports.

³Ross de Vol and Perry Wong, *America's High Tech Economy: Growth Development and Risks for Metro Areas* (Santa Monica, CA: Milken Institute, 1999), p. 13.

⁴David Birch, Anne Haggerty, and William Parsons, *Entrepreneurial Hot Spots: The Best Places in America to Start and Grow a Company* (Cambridge: Cognetics, Inc., 1998).

⁵BankBoston, *MIT: The Impact of Innovation* (Boston, MA: BankBoston, 1997).

⁶"A Decade Of Research Spins Off 220 Companies From UCSD," *San Diego Metropolitan*, December 2004, available at <http://www.sandiegometro.com/2004/dec/sdscene2.php>, accessed on 30 August 2006.

⁷A.J. Lotka, "The frequency distribution of scientific productivity," *Journal of the Washington Academy*, vol. 16, no. 12 (1927): 317-323.

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- ⁸ NYSTAR, "Centers for Advanced Technology," NYSTAR, <http://www.nystar.state.ny.us/cats.htm>, accessed 30 August 2006.
- ⁹ NYSTAR, "Centers for Advanced Technology Program Statute," NYSTAR, <http://www.nystar.state.ny.us/cats/catsstatute.htm>, accessed 30 August 2006.
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- ¹² "WFU researcher quickly becomes 'big fish' in W-S," *Business Journal of the Greater Triad Area*, April 4, 2005, available at <http://triad.bizjournals.com/triad/stories/2005/04/04/story3.html>, accessed 30 August 2006.
- ¹³ Sandra Woodley, "Leveraging Research Dollars," August 15, 2003 presentation at the State Higher Education Executive Officers' 2003 Professional Development Meeting, available at http://www.sheeo.org/about/pd_pres_03/woodley_pd_03.ppt, accessed 30 August 2006.
- ¹⁴ Maryland Industrial Partnerships (MIPS), available at <http://www.mips.umd.edu/>, accessed 30 August 2006.
- ¹⁵ Washington Technology Center, available at <http://www.watechcenter.org/index.php?p=RTD+Grant+Program&s=66>, accessed 30 August 2006.
- ¹⁶ Deshpande Center for Technological Innovation, available at <http://web.mit.edu/deshpandecenter/about.html>, accessed 30 August 2006.

Resource Guide: Entrepreneurship



Introduction

A recent study commissioned by the U.S. Small Business Administration contends innovation without entrepreneurship generally yields minimal local economic impact. On the other hand, “entrepreneurship enhances the regional economic impact of investments in innovation.”¹ The relation of innovation and entrepreneurship and the importance of entrepreneurship to the local economy is borne out by the report’s findings that:

The most entrepreneurial regions had better local economies from 1990 to 2001 compared to the least entrepreneurial. They had 125 percent higher employment growth, 58 percent higher wage growth and 109 percent higher productivity. This general finding held individually for large, medium and small-sized regions but was most pronounced for large regions.²

The most entrepreneurial regions were associated with higher levels of technology. They expended nearly 54 percent more of R&D, recorded 67 percent more patents per labor force participant, had a 63 percent higher percentage of hi-tech establishments and had a 42 percent higher portion of college educated population than the least entrepreneurial regions.

To tap the benefits of entrepreneurship, states and regions have begun to examine their local entrepreneurial environments to identify the gaps in information, services and resources that hinder vigorous entrepreneurial activity.

“Innovations are highly portable, whereas entrepreneurship is place-based. Whether they are building new firms or reinventing existing ones, entrepreneurs, through the application of new ideas to products and services, capture locally the economic benefits of innovation. Developing strategies, policies and programs for leveraging the nexus between innovation and entrepreneurship, therefore, appears to be of vital importance to the competitiveness and vitality of regions.”³

The purpose of this section of the guide is to share best practices and lessons learned by technology-based economic development practitioners who have implemented strategies, policies and programs for leveraging that nexus in order to create a culture of self-sustaining entrepreneurship in their regions.

Facilitating Entrepreneurship: Overview

Facilitating entrepreneurship focuses primarily on educating, and stimulating economically productive activity by the private sector (entrepreneurs and investors). If successful, the intended results are a self-sustaining entrepreneurial economy and a diminished need for government intervention over time.

In the near term, however, most of these initiatives are very labor-intensive because of the diversity of the constituents served and the barriers to engaging those constituents (e.g., identifying potential entrepreneurs and latent angel investors, geographic distance of venture capital firms, identifying and recruiting experienced entrepreneurial managers, etc.), as well as the amount of education and technical assistance needed by clients.

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The initiatives may also cost more up-front than some traditional public sector economic development programs, in part because of what practitioners cite as the necessity of employing specialized, experienced staff – often through contracts with private sector organizations – and paying them competitive, private sector-comparable wages.

However, practitioners compare these up-front costs against the economic impacts the initiatives stimulate over time. If the programs are successful, this leverage ratio should be sufficiently positive that practitioners can use it to justify continuation of the efforts until the goal of a self-sustaining entrepreneurial culture has been achieved.

OBJECTIVE

The objective of facilitating entrepreneurship is increasing the level of entrepreneurship and improving entrepreneurs' chances of establishing successful technology enterprises by honing their skills and providing access to necessary tools, technical and financial resources, and by working proactively to enhance the local entrepreneurial environment.

STRATEGIES

In order to cultivate entrepreneurship, tech-based economic development organizations offer an array of services, programs, and delivery mechanisms. The strategies for encouraging entrepreneurship, however, are relatively consistent. They are:

Facilitate access to critical resources, including:

- Technology
- Know-how
- Capital
- Social networks
- Facilities

Create and implement a comprehensive set of initiatives, a continuum of support services to entrepreneurs, that:

- Assist start-ups
- Drive deal flow
- Promote capital formation

Promote a culture of entrepreneurship in the region.

CRITICAL RESOURCES

Based on interviews conducted for this guide, five resources were consistently identified as being required to support entrepreneurship for a tech-based economy. They are:

1. Technology

The presence of, and access to, technology generators is important to sustaining and growing an innovation economy. Universities, non-profit research institutions, and large corporations are recognized sources of new technologies. However, many commercialization center officials interviewed for this report indicate that a majority of the technologies they have helped commercialize were not generated by universities, but by private, start-up companies.

No matter the source, the necessity for access to commercializable technology by entrepreneurs is apparent. In order to drive deal flow (defined as the rate at which investment offers are presented to funding institutions), public sector entities have attempted to facilitate access to university or orphan corporate-developed technologies by entrepreneurs and investors. TBED practitioners said they have found it important to establish positive working relationships with research institutions' technology transfer offices, educate research faculty about commercialization, and showcase faculty research to the entrepreneurial and investment communities in order to facilitate access to, and thereby accelerate commercialization of, locally-generated research.

2. Know-how

The most critical need cited by most officials interviewed for this report was experienced management talent. Given the availability of technology and capital,



management talent is seen by many of the practitioners as the most important single, determining factor to successful commercialization and enterprise creation.

Qualified, experienced entrepreneurs who carry a few “battle scars” and have weathered some failures on the road to success are coveted by investors and by TBED officials trying to accelerate technology commercialization. Such serial entrepreneurs can be good judges of quality deals and are often on the lookout for new opportunities.

The individuals most sought after to lead start-up companies are a unique breed; simply having general business management experience is not enough. “The successful operation of early-stage companies can demand very different management skills. . . Because much of the skills needed for managing startup companies comes through experience, the existence of managers who do not have this background can significantly undermine a company’s ability to succeed.”⁴

The availability of experienced entrepreneurial management for a start-up company may, in turn, mean the difference in whether the company receives the investment capital it needs to move forward. While the technology is important to investors, “Venture capitalists are well aware that many promising technologies do not ultimately fill market needs. As a result, most place the greatest emphasis on the experience and flexibility of the management team and the size of the potential market. Even if the market does not evolve as predicted, with a sophisticated team the firm may be able to find an attractive opportunity.”⁵

Experienced serial entrepreneurs can have an impact beyond the management of a specific company. In many cases, after achieving their own success, these individuals are willing to share the benefit of their experience by advising new entrepreneurs in a mentorship relationship.

Practitioners from states and communities with fewer resources or younger, less vibrant entrepreneurial cultures report that they aggressively pursue serial entrepreneurs. They have devised programs to identify successful entrepreneurs who have left the area and lure them back home. They also report working hard to “grow their own” crop of entrepreneurs. Entrepreneurial training opportunities are proliferating in communities across the country, from one-day seminars to university courses for college credit. Their purposes are to expose students, faculty, and individuals in the community to entrepreneurship as a potential career path, help aspiring entrepreneurs hone their skills and increase their chances of success, and grow a cadre of entrepreneurs who will flourish within a particular region and form the basis of a self-sustaining entrepreneurial culture.

3. Capital

In order for a new venture to take root and grow locally, sufficient funding at each stage of development must be accessible. Practitioners from many regions report that a shortage of local capital – particularly angel and seed funding – is a significant inhibitor of entrepreneurial growth. The importance of capital and the approaches being used to address the need are covered in detail in the next section of this report.

4. Social Networks

Entrepreneurs seem most open to learning from others who have encountered, or are encountering, similar obstacles. For this reason, practitioners say the importance of networking cannot be overstressed. Networking may lead entrepreneurs to technical and financial resources they did not know were available. Networking can also offer entrepreneurs encouragement to continue their work, encouragement that may be especially important in a culture that does not value entrepreneurial activity.⁶

Networking opportunities take a variety of forms, from breakfasts or luncheons where entrepreneurs make formal presentations to investors, to recognition events, to the daily casual interactions of entrepreneurs clustered together in an incubator or research park. Networking events may appear to be deceptively unstructured activities. Yet unstructured events that allow entrepreneurs to focus on mingling and exchanging information with each other and with

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members of their support community have been reported to yield significant results.

5. Facilities

With limited resources, another challenge for start-up companies can be identifying and securing appropriate and affordable physical space from which to operate. This poses a greater challenge for some companies – biosciences companies often need specialized wet lab space – than others.

The availability of appropriate and affordable physical space for start-up companies varies from region to region. Where such facilities are otherwise scarce, some states, regions and universities have established incubators – specialized, multi-tenant facilities featuring specific tenant qualifications for entry, and a contractual agreement that the company will “graduate” and leave the incubator after a specified period of time. Appropriate, affordable space is not the only benefit provided by incubators, however. Practitioners who oversee incubator facilities report that entrepreneurs benefit from being in proximity to each other, which facilitates networking and information exchange. Furthermore, the majority of practitioners interviewed believe strongly that the most successful incubators are those that also provide, or provide access to, many of the technical assistance services described in this guide, and proactively foster productive networking among their tenants.

Practitioners from other regions report that they have determined it is a better use of their resources to invest in services and funding programs than in provision of physical space. In these regions, the practitioners say, since availability of appropriate space is less of an issue, they are reluctant to devote scarce resources to real estate management functions.

SERVICE DELIVERY

Practitioners interviewed for this guide described a wide variety of service delivery approaches. Examples include:

- A comprehensive portfolio of services may be offered by one umbrella organization, or these services may be divided among a number of organizations.
- Some organizations’ scope is statewide, while others’ is regional or local.
- In some cases, one organization will serve the entire state from a central office. Other models feature a central office that establishes and coordinates multiple regional offices which, in turn, provide the services locally.
- Yet another model features a state agency providing funding for activities, in the form of grants or contracts, to multiple, external service provider organizations, both public and private, situated in different parts of the state.
- When services are offered by several entities, one organization may act as a facilitator and coordinator for the rest so that entrepreneurs may more easily and productively access the separate services, and not “fall through the cracks” when being handed off from one service provider to another.
- Services for entrepreneurs may be provided through, or in direct collaboration with, an incubator facility; or, more often, they may be offered by an entity without direct ties to an incubator.
- A service or combination of services may be offered by private, not-for-profit entities, such as commercialization centers, by an incubator, by a university or community college, or by a public sector agency charged with tech-based economic development.
- Among those interviewed, most often services are provided on behalf of the government by a private entity, funded by a combination of public funds, fees, and, in some cases, return on investments.



Example

One example of facilitating services offered by a variety of service providers is **Team Rochester**. In an environment of many diverse, unconnected organizations that served or impacted entrepreneurs, the **Greater Rochester Enterprise** organization (GRE) saw the need to provide more consistent, coordinated, effective and accessible assistance to entrepreneurs in its area.

GRE established Team Rochester as an umbrella group incorporating all the key players in the region. Team Rochester includes angels and venture capital groups involved in seed funding; the universities; city, county and state government; the community college and local training organization; the regional planning group; and others. GRE plays the role of “facilitating the connectedness” necessary to help an entrepreneur negotiate the array of service providers, and insure that the service providers focus on the entrepreneur’s particular type of company.

GRE works with the organizations to help them develop a plan and an effective approach. It occasionally provides some matching funds to catalyze the launch of new efforts.

The decision on whether to adopt a centralized or a regionalized approach appears to be influenced by population, population distribution, regional homogeneity or lack thereof, availability of financial resources, and/or the established competencies or political power of existing organizations. In states where a regional approach is taken, effective regional offices are designed to deal with the different needs of different areas; however, in a less favorable environment, practitioners report that regional offices can become fiefdoms competing with each other. No single approach is superior to others; rather, practitioners said, delivery mechanisms should be tailored to the unique needs and features of the area served.

*Facilitating Entrepreneurship: Initiatives***SELECTING TARGET MARKETS FOR ASSISTANCE**

Typically, private investors are interested in seeing deals with high-growth potential that will result in a good return in investment and provide an exit strategy for the investor either through a merger or acquisition. While angel investors’ and venture capitalists’ prime motivation may be the highest rate-of-return on their investment, for economic development organizations, the prime motivation may be creation of high-quality jobs regardless of the rate of growth of the company.

Some practitioners pointed out that it may be a smart economic development strategy to focus on those companies whose sales and employment potential are not high enough to attract private investors but could still have a significant impact on the community. This can be a particularly effective strategy in rural areas that may not have the resources in the form of financing, technically specialized workforce and experienced management to support a rapidly growing technology company, but can support a company whose employment is more likely to max out around 20-50 employees. While the growth trajectory of those companies may not be as dramatic, they can offer solid, quality jobs and contribute to a stable local economy.

Policymakers and practitioners would be wise to consider what their target market for assistance is, as the kinds of assistance and who provides that assistance will vary depending on what kind of companies are being targeted. For example, if a region has enough activity to support a focus on high-growth companies, more emphasis may be placed on developing relationships with private investors and preparing entrepreneurs for making investment pitches. If, however, that base does not exist, then more emphasis may need to be placed on helping entrepreneurs develop the plans for their business and providing support services to the companies. Similarly, when considering financing programs, it may be more appropriate to develop debt financing rather than equity programs.

ASSIST START-UPS**Overview**

TBED organizations sponsor a variety of services and activities to assist fledgling

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entrepreneurs. Common approaches include:

- Entrepreneurial training
- Entrepreneurial directories
- Mentoring and coaching entrepreneurs
- Providing access to funding
- Preparing entrepreneurs to present to investors
- Networking events
- Incubators

Though some reported activities are small in and of themselves, together they function as spokes of a wheel supporting the entrepreneurial infrastructure. Each activity is discussed in more detail below. Because entrepreneurs need support at each stage of their efforts to establish and grow and become a thriving enterprise, practitioners recommended providing a comprehensive continuum of entrepreneurship assistance programs either through services provided directly or by others.

Initiatives can be technology-driven (the organization identifies technology to be commercialized and finds an entrepreneur to commercialize it) or entrepreneur-driven (entrepreneur seeks assistance to commercialize his/her technology). Commercialization organizations often provide a combination of technical and financial assistance. In the case of incubators, space is provided appropriate to the types of tenants, along with varying levels of technical assistance.

Delivery mechanisms

A comprehensive portfolio of services may be offered by one umbrella organization, or be divided among a number of organizations.

A service or combination of services may be offered by an entity specifically chartered to work with start-up firms to commercialize technologies, and that is not directly attached to an incubator. These organizations go by various titles, such as commercialization centers, commercialization corporations, enterprise centers, technology development offices, and so forth, but are similar in function and in the types of services offered.

The commercialization programs are distinct from the more-familiar SBA-sponsored Small Business Development Centers (SBDCs), both in the clients they serve and the services they offer. They tend to serve innovation-oriented start-ups, whereas most SBDCs serve more traditional, small retail and service companies. The nature of the clients drives the type of services they offer, including assistance with transferring, protecting and commercializing intellectual property—which could be generated at a university, a federal or private lab, or the company itself—a focus on obtaining high-risk pre-seed, seed and early-stage financing, and business planning built around these issues. Some programs are closely affiliated with universities, with a primary mission of commercializing university-developed technologies. Others deal primarily with private-sector entrepreneurs seeking to commercialize their own technologies. Most deal with a combination of the two.

Program staff may provide services directly, may coordinate the services of volunteer or paid mentors, may refer clients to third party service providers, or some combination of all three. According to practitioners interviewed, the amount and complexity of service provided directly by staff often hinges on the level of resources available to pay the staff. Larger staffs often include individuals who, among them, may have venture capital experience, financial expertise, familiarity with intellectual property issues, engineering or scientific backgrounds, and direct experience with entrepreneurship. The skill sets are important, practitioners emphasize, both for successful engagement with entrepreneurs and for establishing credibility within the business and investment community.

Example

John Pappajohn Entrepreneurial Centers

Founded by University of Iowa alumnus John Pappajohn, the John Pappajohn Entrepreneurial Centers assist in the creation of sustainable Iowa companies through their work with entrepreneurs across the state. The five Centers are located at the University of Iowa, Iowa State University, University of



Northern Iowa, North Iowa Area Community College, Drake University, and Iowa Small Business Development Centers. These centers report they have collectively helped create and launch more than 1,000 companies.

Iowa entrepreneurs are provided hands-on and easily accessible services each year. Examples of the technical services and guidance provided include:

- Business start-up and expansion services including one-on-one business counseling, educational programs, linkages to market research, and incubators and business accelerators;
- Technical assistance such as access to Iowa universities' technology development resources, tech transfer from university research, intellectual property assessment and advice, and research and development funding sources; and
- Access to capital through seed and venture funds, guidance to commercial lending and small business lending programs, annual venture capital and entrepreneur conference, and an extensive resource base of experienced business and investment expertise.

The Centers also foster entrepreneurial communities and regions through entrepreneurial development training and participation on local, regional and statewide boards to promote entrepreneurship in Iowa. Universities and colleges that house the Centers offer majors and minors in entrepreneurship, student business incubators and business plan competitions, speaker and lecture series, and student field study projects solving real business problems for Iowa companies.⁷

Entrepreneurial training

Basic entrepreneurship training workshops (in contrast to in-depth courses offered at universities for college credit) typically provide a broad overview of the tasks and challenges facing the would-be entrepreneur, and lay out a general roadmap by which he or she may proceed. These training courses also provide a venue to make entrepreneurs aware of locally available services, as well as to promote the region's support network for entrepreneurs.

Entrepreneurship training venues are beginning to proliferate through universities, community colleges, vocational-technical schools, leadership and community organizations, as well as commercialization centers. Some practitioners report that having more sources for basic entrepreneurship training reduces pressure on their organizations to devote significant resources to this basic-level activity.

Practitioners hope that the increasing popularity of entrepreneurship training programs is an indicator of a growing population of potential entrepreneurs willing to pursue the risks and rewards of entrepreneurship. Demographic trends appear to support this hope, as Generation X and the "Millennial" generation are becoming the most entrepreneurial generations in history.⁸

Example

A host of organizations nationwide offer the **FastTrac™** program sponsored by the Ewing Marion Kauffman Foundation.

FastTrac™ is a comprehensive entrepreneurship-educational program that provides entrepreneurs with business insights, leadership skills and professional networking connections so they are prepared to create a new business or expand an existing enterprise. The FastTrac™ program includes practical, hands-on business development programs and workshops for existing entrepreneurs, aspiring entrepreneurs, as well as entrepreneurship curriculum for college students.

FastTrac™ programs were first launched through the University of Southern California's Entrepreneurship Program in Los Angeles in 1986. In an effort to launch the FastTrac™ program nationally and continue accelerating entrepreneurship in America, the Ewing Marion Kauffman Foundation became the major funder and supporter of FastTrac™ in 1993.

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FastTrac™ programs are currently being provided by 270 partner organizations in 49 states, Australia and Russia. More than 95,000 participants have completed FastTrac™ classes in the United States since 1993.⁹

Directory of entrepreneurship services

One of the simplest means of ensuring that entrepreneurs receive assistance that they need is to ensure that they know what resources are available to them. A few regions are experimenting with offering either print or web directories of services that are being offered by all organizations in a region. These directories effectively serve as a one-stop shop for entrepreneurs to identify who might be able to assist them.

Some of the practitioners report that the directories have the added benefits of inventorying what services are available in a region and bringing the service providers together. The exercise of preparing the inventory, therefore, can help identify what gaps may exist in a region and help shape new program delivery. By bringing the service providers together to report on the services they are offering, some practitioners have found that it has helped break down barriers between organizations that may have previously fought over turf, and to encourage new collaborations among groups when they see that another group is providing a service that their clients can use.

One practitioner observed that the larger the population area and the more fragmented the services, the more challenging it can be to offer a physical “one-stop-shop” where entrepreneurs can go and be directed to all the services they need. A directory of services can be a logical response to this situation.

Mentoring and coaching

Technology start-ups face an array of challenges that are different and more complex than those faced by traditional small businesses. Helping entrepreneurs negotiate the obstacles is the core service entrepreneurial support programs can provide. All of the practitioners interviewed on entrepreneurship said their programs included some sort of mentoring/coaching/technical assistance component, whether provided by an incubator or commercialization center staff, entrepreneurs in residence, or volunteer teams of experienced entrepreneurs, angel investors and business executives. This assistance was described as extremely important for new start-ups to help them succeed in securing private investment and avoid fatal pitfalls.

Just what are the challenges faced by entrepreneurs, and how do commercialization centers help entrepreneurs understand and tackle these challenges? All of the practitioners interviewed emphasized the importance of both structure and flexibility in assisting entrepreneurs. A number reported that they utilize specific tools that help ensure entrepreneurs cover all the necessary bases. One example is *The Commercialization Activities Roadmap* developed and used by i2E, Inc. for the Oklahoma Technology Commercialization Center; the copyrighted tool is reprinted with permission and can be found in Appendix A.

One common approach reported by practitioners is to assemble teams of mentors – composed of seasoned, serial entrepreneurs and other members of the business and investment community – to advise fledgling companies in specific settings at specific times. For some TBED organizations, these mentor teams also act as standing advisory committees. These same advisers also provide feedback on the viability and progress of the TBED organization’s client companies.

While some programs rely heavily on their mentor teams to assist and groom companies, others assemble mentoring teams for evaluation workshops that occur at specific intervals and invest more heavily in their own full-time staff of paid experts. In this model, the staff fills much of the mentoring role, grooming the client company until it can be paired productively with a long-term, private sector mentor to help move it to the next stage.

Some practitioners report that a concern voiced by potential mentors is that their liability needs to be limited. In the absence of insurance or other arrangements, to address this concern they may be advised not to sign documents, not to participate



formally on boards, and be clear that they function in an advisory capacity only.

Example

One approach to mentoring is that of **The Ben Franklin Technology Partners of Central and Northern Pennsylvania's Transformation Business Services Network**. The Network provides operational assistance to past, current and potential future portfolio companies. The support is focused in functional areas to augment the capability of the companies' management teams. The Network staff is co-located with Ben Franklin in its three offices in Erie, Harrisburg and State College. The service is provided through a contract with a not-for-profit organization that fields the staff of experts.

This Network consists of nine individuals with a reported 234 years of combined industrial experience in marketing, strategic planning, general management, finance, human resource planning and accounting. If appropriate, the Network is able to provide other specialized support through outside (e.g., legal) consultants.

The Network also conducts four business plan contests for the Center and takes responsibility for Entrepreneur Day events in State College and Erie. These events include lectures on topics such as intellectual property protection, company investment presentations and finance. According to the Ben Franklin Technology Partners of Central and Northern Pennsylvania website, in 2004 the Network supported 180 companies with over 10,400 person-hours of direct effort.¹⁰

When it comes to finding experienced entrepreneur mentors for companies, states with a shorter history of entrepreneurship and fewer serial entrepreneurs face a "chicken and egg" problem: it takes good deals to attract the interest of mentors, yet mentors are needed to help generate good deals. And good mentors – in the form of experienced serial entrepreneurs – it turns out are often hard to find, an issue discussed further in this section, **Recruiting management talent**.

Providing access to funding

One of the ways to encourage entrepreneurship is to ensure there is a ready supply of capital for start-up and growing companies. Different approaches for addressing access to capital are described in much more detail in the Capital section of this report; however, organizations working with entrepreneurs identified some critical points that should not be overlooked when creating a new initiative or planning new activities for an existing one. Practitioners described two general approaches: providing direct funding to companies or assisting companies in accessing the investment community.

a. Direct funding. While most of the practitioners interviewed on this topic indicated that they provide assistance to gain access to public or private funding offered through other entities, a number of practitioners also reported having a fund of some type under their own control to assist clients. Practitioners who have direct control of a fund observed the organization has added flexibility in working with start-up companies and in helping generate deal flow by attracting clients.

b. Relationship to investment community. Practitioners agreed that it is essential for them to develop and maintain a close working relationship with the investment community in their region. Commercialization centers and incubators are more likely to be perceived by the investment community as valuable partners if they promote deal flow, conduct thorough, credible and consistent due diligence, and always present investors with well-scrubbed, quality deals. A well-established relationship of trust and credibility on the part of the program serves the interests of its client entrepreneurs in that it increases their ability to make successful connections with funding sources.

Preparing entrepreneurs to present to investors

Entrepreneurs' chances of gaining private financing at critical junctures are significantly enhanced if they go into a presentation to investors well prepared.

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Practitioners pointed out that this is especially true where early-stage capital is scarce and there is little serial entrepreneurship or serial investment activity, because an entrepreneur in these regions may only get one shot at getting the financing he or she requires.

Most practitioners interviewed have a process for helping entrepreneurs prepare their presentations for investors. This process is not a standalone activity, however. Preparation actually begins much earlier, as the practitioner works with the entrepreneur to ensure that they have a viable business model, an appropriate valuation, and all the other background information that will provide the foundation for a credible presentation. Only then can they begin work on the presentation itself.

Entrepreneurs often develop Power Point presentations for their pitch to investors. Because of a tendency to erroneously think more is better, they often need help simplifying their presentations. One practitioner recommends the approach of entrepreneur and author Guy Kawasaki, whose *"The Art of the Start"* advises entrepreneurs to adopt his "10/20/30 rule": ten slides, given in 20 minutes, using a minimum of a 30-point font.

Again, practitioners stressed, the relationship those assisting the entrepreneurs have built with the potential investors to whom the entrepreneur will present is a factor. If the organization has a good reputation for bringing forward quality deals, the investors are more likely to be predisposed to hearing the next client entrepreneur's presentation.

Networking events

One practitioner observed that networking events provide an opportunity for entrepreneurs to get together and "enjoy one another's company and one another's misery and one another's experiences of all kinds." Entrepreneurs gain know-how through their ability to access and utilize networks and networking opportunities.

"Research on the sociology of entrepreneurship has shown that entrepreneurs learn from social relationships that expand access to information, resources and social support. Thus entrepreneurship is embedded in networks of continuing social relations. The more extensive, complex and diverse the web of relationships in a community, the more the entrepreneur is likely to have access to opportunities, the greater the chance of solving problems expeditiously, and ultimately the greater the chance of success for the venture. Networking thus provides access to professional expertise, like accountants, lawyers and experienced managers, who can troubleshoot for entrepreneurs."¹¹

Networking is considered so critical to the success of entrepreneurs and the growth of an entrepreneurial climate that the practitioners interviewed see providing networking opportunities as a distinct and essential service. Breakfasts or luncheons where entrepreneurs make formal presentations to potential investors have long been popular, but networking opportunities take a variety of forms from recognition events to the daily casual interactions of entrepreneurs clustered together in an incubator or research park. A number of practitioners stressed that networking events don't have to be complicated to be successful. Some even said simpler ones are better in that there is no agenda other than mingling and making connections. One practitioner pointed out that events where entrepreneurs make presentations to investors can be effective, but only for the one or two entrepreneurs presenting, while more casual gatherings open the possibility of multiple contacts.

Some practitioners commented that networking events are much more effective than static efforts—such as websites—as means to make entrepreneurs aware of available technologies and services. Because technology commercialization is a "contact sport," practitioners emphasize, success sometimes boils down to putting the right people in the room together.

Example

Based on the notion that state government may not be the best entity to organize this type of networking activity, **Utah** leverages its resources by providing financial and staff support to the state's many private sector industry associations, angel groups and other entities. Utah provides



financial support to about a dozen groups through contracts, generally in the \$5,000 to \$10,000 range, and also co-sponsors these organizations' conferences and provides volunteer staff support.

Different environments call for different types of networking events. A Utah bi-monthly breakfast program, where entrepreneurs would make presentations to investors, that started in 1992, was subsequently discontinued when organizers concluded the local venture capital community had become sophisticated and active enough that it had outgrown the need for the event.

However, networking is as critical in Utah as ever. A number of organizations and associations, such as the Utah Information Technologies Association and the Wayne Brown Institute, hold regular breakfast, lunch or dinner meetings, sponsor the Utah 100 event showcasing the fastest growing companies in the state, induct technology leaders into a hall of fame, and host a variety of other events. The net effect is that there are several entrepreneurial events going on every month, and each is designed as a networking opportunity to bring the business and entrepreneurial community together with the academic and government communities. The result is that deals get done, new ideas get introduced, and people begin to make connections.

Incubators

Ask most economic development professionals for a definition of a business incubator, and most likely they will describe incubators as providing low-cost office space and support services that are designed to increase the survival chances of start-up companies. While that may be the easiest definition, it provides just a partial view of incubators. According to the National Business Incubation Association (NBIA), "Business incubation. . . accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with an array of targeted resources and services. These services are usually developed or orchestrated by incubator management and offered both in the business incubator and through its network of contacts. A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding."¹²

More than just cheap office space, NBIA considers integral to the very definition of an incubator "the provision of management guidance, technical assistance and consulting tailored to young growing companies." Only with this point clarified does NBIA go on to say that "Incubators usually also provide clients access to appropriate rental space and flexible leases, shared basic business services and equipment, technology support services and assistance in obtaining the financing necessary for company growth."¹³

The consensus among those interviewed was that an incubator should be created only if a clear need, a sufficient market, and adequate resources to support the incubator have first been identified. Some argued that technology incubators in densely populated regions were more likely to be successful because there would be a higher flow of applicants and more resources available to assist clients.

a. Types of Incubators. In discussing incubators as a strategy to facilitating entrepreneurship, the practitioners interviewed for this guide were quick to make the distinction between incubators whose primary focus was "cheap office space" and those providing "guidance, technical assistance and consulting tailored to young growing companies." Incubators, they said, could be divided into two categories: "real estate" (i.e., those whose main focus was on providing cheap office space) or "value-add" (i.e., those that provided active assistance to clients). The good incubators are the "value-add" ones. Incubators whose goal is the successful graduation of tenants, practitioners said, will provide access to value-added resources and services, and will work actively to promote a robust social network within the incubator to support and encourage fledgling entrepreneurs. More than one person pointed out that after the recession of the early years of this decade, finding cheap office space in most areas was not particularly difficult.

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Practitioners stressed the importance of objectively assessing the resources available and the environment when determining the client mix and services of an incubator. They said that care should be taken to avoid selecting the wrong market or putting in the wrong resources for the market an incubator intends to serve.

b. Targeting by industry sector. In the effort to build a technology cluster in a particular industry, some incubators focus on specific industry sectors. Some of the practitioners interviewed argued that incubators that offer resources attractive to a particular industry segment (e.g., product development centers for manufacturing, wet lab space for life sciences) can differentiate themselves from other incubators and increase their chances of attracting quality companies from the targeted sector. While targeting has some advantages, practitioners advised that incubator planners would be wise to first carefully assess their markets and their resources. If they determine that they want to serve a narrow market, or if the incubator has specialized expertise or specialized resources to offer, targeting or clustering makes sense.

In some cases, practitioners cautioned, targeting can add to the expense of the incubator. If the targeted clients need access to clean-room facilities, for example, the incubator planners must determine if they can provide those resources, if they need to locate a partner organization that can provide the resource, or, if neither of those options appear viable, then perhaps the planners should reassess whether the targeted sector is appropriate for them.

c. Services offered. As mentioned previously, incubators may provide technical assistance services directly, or link tenants with external service providers. One advantage of the latter approach, practitioners said, is that it allows the incubator manager to serve as an “honest broker” on behalf of tenants, enabling them to judge the quality of services more objectively, perhaps, than if the incubator were offering the services directly.

Incubator services range from minimal – essentially, real estate only – to comprehensive, with all the elements needed to support an entrepreneur through the start-up process. Among the services incubator managers listed as being offered, alone or in combination, were:

- Specialized resources (from clean rooms to wet lab space to product development centers)
- Coaching and mentoring
- Networking
- Preparation for meetings with angels
- Access to angel investors

d. Attributes of a successful incubator manager. Practitioners interviewed believe that incubator managers need to be flexible and responsive rather than predictive. That is, that they should let the demonstrated needs of their clients drive the programs and services they offer more than trying to be predictive about determining clients’ needs, and thereby the services that will be offered.

One practitioner thinks that attributes of a successful manager include, “not presuming to know more than the guy running the company.” Another said that “management by walking around” is often an effective approach for incubator managers because they can use what they hear from tenants to continuously shape and improve the incubator’s services. Practitioners interviewed agreed that incubator managers must constantly “pay attention and listen” to their clients, not only to determine their needs, but also to assess how successfully the services offered (whether internally or by external service providers) actually meet those needs. It’s one thing to offer services, they said; it’s another for those services to be utilized, and utilized to good effect.

A practitioner with experience in both environments observed that running a successful incubator is very analogous to managing a college dormitory, because much of incubator management involves managing relationships between tenants, promoting a positive environment, and being responsive to tenants’



needs. Another said that a good incubator manager can be compared to a party host who knows how to bring the right people together for the right purpose and generate productive interactions among them. In this regard, the ability to generate and sustain a positive social network within the incubator is a valuable skill.

Incubator managers must often be skilled diplomats. Interviewees reported that some managers find themselves acting as “buffers” between their tenants and their boards when board members advocate overly-rigid adherence to screening, management and graduation rules, or when individual members come to the incubator board with outside agendas related to other institutions.

e. Guidelines for screening and graduating tenants. Most practitioners interviewed agreed that while structure and rules are essential, maintaining a degree of flexibility is strongly advised. One manager said that there are “some pretty good rules of thumb, but very few absolutes.” One reason for maintaining flexibility in dealing with tenants, said a practitioner, is that, “You don’t want your short-run expectations to run afoul of your long-term mission.” Another, he said, is to avoid precluding opportunities one would later wish had not been precluded.

Based on the nature of the incubator – type of facilities, rental rates, tenants already in the incubator, services offered – managers said that companies will often “self-select” as to whether they would be appropriate tenants for that particular incubator.

One incubator manager described his incubator’s screening process for admitting companies as “highly personalized.” Incubator staff meet with the potential tenant and “go through a learning process together.” Basic information is gathered: What is the technology? What is its status? Who are the competitors? What is the market potential? What is the status of the business plan? What is the status of the funding? This incubator manager said, “We want to avoid a checklist but at least it keeps us working hard until we basically cover all the areas and just try to make sure that there aren’t any real surprises that are going to be the cause of the death of the company in the first six months.” It should be noted as well that whether companies are able to answer this basic information is an important indicator as to how skilled and serious the entrepreneur is.

Those interviewed stressed that, in addition to the guidance provided by standard policies, incubator managers should have the freedom to use their instincts and good judgment about current and potential clients in order to increase the chance of the clients’ ultimate success. This, they said, pertains to determining which companies may become and remain tenants, and when to graduate tenants. A good incubator manager, they believe, must be perceptive and insightful about the “realness” of prospective tenants when screening companies for location in the incubator.

While flexibility and the instincts of an experienced manager are important, equally important, said practitioners, is an established graduation policy, with the clear understanding on the part of the tenant that “you don’t get to stay here forever.” Milestones or checkpoints should be built into the lease agreement.

While a policy of graduation after three to five years was cited as generally reasonable, even here practitioners returned to the importance of flexibility, saying that retaining flexibility by industry (e.g., biotech companies usually take longer than IT companies to graduate) and for specific cases increases chances of success. Along with the flexibility, one practitioner advised “always keeping the pressure on so that the companies move ahead and meet their milestones, and move towards creating something much bigger.” With a combination of agreed-upon milestones and flexibility, the incubator manager has the tools to move non-performing companies out of the incubator, while offering the companies with greatest potential the latitude to succeed.

When it comes to graduating companies, one practitioner even cited the quality

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of the physical setting as a factor. He felt like an incubator setting shouldn't be too nice, so that tenants will want to move out when it is time. Comparing incubator tenants to college dormitory residents, another manager only half-jokingly said, "If you find somebody who doesn't want to move out, you don't want them there!"

f. Value of the social network within the incubator environment. Creating, establishing and maintaining an environment that says to tenants "We are here for your success" is one of the most important things an incubator can do, from the perspective of practitioners interviewed.

The existence and quality of the social network that results from clients' interaction with each other in the shared space of the incubator may not be the first thing that comes to mind when listing essential attributes of successful incubators. It is not a "program" that can be designed nor easily quantified and measured. However, practitioners believe that it is one of the most valuable, productive "services" that a good incubator provides.

The social network allows tenants to learn from each other in an informal setting. The ability to access the knowledge of others is key. Entrepreneurs often judge value by what their peers see value in, so it is useful to create an environment where entrepreneurs have access to their peers. A factor in encouraging entrepreneurship is social networking, and because in some regions this networking may not occur within the larger community, the incubator can provide an ideal setting for it to occur.

The internal networking activity also helps the incubator manager. As one manager put it, "It is easier for me to encounter someone in the hallway, and to get incredibly insightful information out of our two-second conversation than it is for me to think about a format for meeting with me once a month."

g. Building design. To the extent possible, one practitioner advised, the building design should facilitate social interaction, with glass, open doors, shared hallways, and so forth. More than anything, the practitioners interviewed on this topic emphasized that the ideal is to have space that provides flexibility to change configuration as tenants' needs change. While old buildings have been successfully retrofitted as incubators, new buildings offer the ability to tailor the space as a multi-tenant technology incubator. Incubator managers interviewed said that it is important for the architects designing the space to have had experience in this area and understand the unique space requirements both of successful incubators and of the specific types of companies (e.g., bioscience, IT, manufacturing, etc.) expected to occupy the space.

h. Performance expectations. In keeping with the time it takes for the first tenants to "incubate," experienced practitioners said that incubators themselves should be given at least five years to grow and experiment to determine what works best before their success can begin to be judged. A degree of flexibility in allocation of the budget during this start-up period is also advantageous, they said.

States and communities can tend toward rigid control of incubators because of legitimate concerns about accountability to funders. However, inflexible expectations regarding performance can also be counterproductive. A determination of what makes sense and what does not, both in terms of structure and expectations, will develop over time, practitioners said, so funders should be open to making changes and refining these as needed.

i. Value to the community. Practitioners commented that incubators require a real commitment from the community in order to be successful. From their perspective, that means enough money to build the facility followed by operating commitments. In turn, they say, a successful incubator acts as a focal point to attract resources and people and community attention to innovative start-up companies.

j. The self-sufficiency question. When policymakers contemplate committing public funds to establish an incubator, the question often arises whether the



incubator should be expected to become self-sufficient after a period of time. Self-sufficiency (i.e., no longer requiring public funds) would presumably be based on fees for rent and services that the incubator receives. The majority of practitioners interviewed on this topic asserted that incubators should not be expected to be moneymaking operations. In their view, incubators are part of the business infrastructure in the same sense that good schools and good transportation are.

Most of those interviewed on this topic believed that, in general, incubators should not be expected to be self-sufficient because to do so would undermine the very purpose of incubators. Self-sufficiency implies charging market-rate rental and service fees, precisely what fledgling technology companies are not yet able to afford. Furthermore, the interviewees pointed out, not being dependent on the real estate rental fees for survival allows incubator managers to maintain a rigorous selection and graduation process.

While some incubators can and will become self-sufficient, a requirement for them to do so within an arbitrary time frame may actually undercut achievement of their mission, practitioners said. A common practice to achieve self-sufficiency is for incubators to take equity in their tenant companies. One incubator manager questioned whether or not this, then, tends to bias the decisions of the incubator manager regarding present and potential tenants.

In part because they are not usually a money-making proposition, several practitioners observed that incubators would benefit from having a sponsor whose long-term strategic goals are advanced by the presence of an incubator. This, they said, is why a number of incubators are affiliated with universities; an incubator is helpful to a university because it is a place where faculty can build companies, where graduate students can get jobs, where the long-term value of the university can be increased, it can help meet the university's mission to serve the community, and because it can serve as the beginning step of a research park.

Successful incubators, one practitioner summarized, need a partner with funding and a vested interest (e.g., a university, an economic development organization), a source of money (often primarily or exclusively from the partner), a technology generator (which may or may not be the partner), mentors, and good management.

Example

University of Central Florida Technology Incubator (UCFTI)

With three locations throughout Central Florida totaling over 70,000 square feet, UCFTI provides early-stage technology companies with enabling tools, training and infrastructure to create financially stable high growth enterprises. The goal is to facilitate smarter, faster startup and growth of emerging technology companies so those companies will become financially successful, high-growth companies in the community. Clients are offered an array of services such as:

- Mentoring and advising in all aspects of business development and growth including business and strategic planning, legal counsel, accounting, human resources, government contracting, strategic partnerships, marketing and PR, financing, grant preparation, insurance, and risk management;
- Access to experienced entrepreneurs through the Entrepreneur-in-Residence Program;
- Networking opportunities with peer groups, area professionals, university faculty, and support organizations;
- Adaptable space and flexible leases in several locations in the Orlando area;
- Access to UCF faculty and labs, library and support organizations;
- Shared reception, office equipment, conference rooms, and other support services.

Eligible participants must be a technology-oriented company with

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proprietary technology and plans for product development; demonstrate strong market for products or services; offer potential for significant job creation in the Central Florida area; and remain headquartered in Central Florida. Companies must first submit an application and complete the Excellence in Entrepreneurship Certificate Course to be considered.

A company graduates when it has achieved a level of financial and corporate growth that enables it to leave the incubator and enter the second stage of corporate growth. Since 1999, UCFTI has grown from 12 to over 30 emerging technology companies, which have generated more than 400 new jobs and more than \$100 million in revenues from sales and research and development grants.¹⁴

Example

Advanced Technology Development Center (ATDC)

A nationally recognized science and technology incubator, ATDC helps Georgia entrepreneurs launch and build successful companies. As part of Georgia Tech's Office of Economic Development and Technology Ventures, ATDC was formed in 1980 to stimulate growth in Georgia's technology business base. ATDC offers turnkey services and flexible lease terms in its facilities. Member companies operate in many areas of technology including biomedical technology, computers and electronics, engineering and technology services, environmental technology, Internet applications, manufacturing, new media, optical technology, software, and telecommunications.

ATDC's core offerings include Consulting, Connections, Community, and Centre. Examples of member benefits include:

- Consulting – member companies receive practical business assistance from full-time business advisors who have significant start-up experience.
- Connections – companies gain access to world-class researchers and resources at the Georgia Institute of Technology in addition to connections to potential investors, customers, and business partners.
- Community – weekly Brown Bag Lunches, the CEO Roundtable, socials and other informal interactions allow company leaders to share their success, collaborate on business opportunities and solve common problems.
- Centre – facilities located in Atlanta, Savannah, Columbus, and Warner Robins offer a dynamic environment for entrepreneurship designed specifically for start-ups.

According to an economic impact analysis, ATDC companies have created nearly 42,000 man-years of employment and have generated over \$9.3 billion in revenue since 1987. Based on these figures, ATDC has delivered a 6.8 times return on the funding it has received from the state of Georgia.¹⁵

INCREASE DEAL FLOW

To accelerate investment activity and the growth of a self-sustaining entrepreneurial culture, TBED practitioners interviewed said that it is not enough to simply play matchmaker, linking qualified entrepreneurs with interested investors. Rather, part of the strategy must be to work proactively to increase quality deal flow in the region, which will make the area more attractive to both investors and entrepreneurs. Approaches to increase quality deal flow that interviewees mentioned include screening deals, mentoring promising entrepreneurs, locating and recruiting experienced entrepreneurial management talent, and encouraging the development of new entrepreneurs through activities such as business plan competitions.

Screening and brokering

Investors conduct due diligence on potential investment opportunities in order to verify – through interviews, document review, and on-site inspections when necessary – that the businesses in question are more or less what they appear to be and that the investments are consistent with the investors' criteria. However, investors' capacity to scout out, screen and consider deals is limited by factors of time and distance. "Venture capitalists typically average 50 due diligence telephone calls per deal, many of which are reference checks."¹⁶



These limitations mean that the TBED organization seeking to link its clients with external sources of funding is in a position to provide a valuable service to both investors and entrepreneurs by acting as a funnel, a filter, and a broker of deals for investors to consider. The TBED organization can promote and facilitate deal flow by seeking out and filtering potential deals, validating markets and technologies, conducting a thorough due diligence process, scrubbing the most promising deals, and actively presenting and promoting those opportunities to the investment community.

Practitioners advised that the TBED organization will be successful in this role only to the extent that it firmly establishes its credibility with investors. "Venture capitalists overwhelmingly tend to favor deals referred to them by trusted sources. . . . The reason that venture capitalists take this approach is that they usually know much more about the quality of the source by which a deal was referred than about the quality of the referred deal itself. It makes sense, then, for them to use the quality of the source of the deal, which is well known, as a rough proxy for the quality of the deal, which is not."¹⁷

To establish its credibility with investors, practitioners said the TBED organization must:

- Maintain a competent, experienced staff with good credentials
- Employ a thorough, credible, consistent due diligence process comparable to that of a private investment group
- Take great care in selecting deals for presentation to private investors
- Actively promote itself, its services and its clients to the local, regional, and national investment community.

In order for the client-investor matching process to be successful, the TBED organization staff must also establish a high degree of credibility and trust with the entrepreneur. The process of readying promising entrepreneurs for presentation to outside investors is an intensive, hands-on, personal experience. One practitioner credits the success of his organization in these efforts to the approach the staff takes. "I mean, we roll our sleeves up," he says. "We're not always right, but we dig in there and take the philosophy that we're going to be part of your team for a little while and help you move this thing forward."

Recruiting management talent

For investors, the definition of "a good deal" always includes good management. In many cases, however, the developer of the technology does not have the entrepreneurial management skills necessary to start up and successfully sustain a new business.

However, most practitioners interviewed on entrepreneurship indicated that the biggest problem their region has in encouraging the growth of technology companies is a serious shortage of serial entrepreneurs to provide reliable management for start-up companies. They recognize that the value in locating and securing this talent goes beyond the entrepreneurs themselves; serial entrepreneurs often bring with them the access to good potential board members, networks, potential customers, capital, and other types of resources that might not be presently available in a particular area.

Recruiting this talent, while challenging, is possible, practitioners said, but there must be enough active deal flow to indicate to potential managers that they have more than one option in front of them. Therefore, the practitioner must first locate experienced entrepreneurs who might have an interest in looking at deals in their state or community, and then demonstrate that the deal flow is active and of sufficiently high quality to merit the entrepreneurs' interest.

Virtually all of the practitioners interviewed said they are pursuing various methods to locate and attract experienced entrepreneurial management. This is done on a "retail" and a "wholesale" basis. That is, practitioners may have a specific opportunity for which they are searching for experienced management in order to make the deal attractive to investors. Or, they may seek to identify and create a stable of experienced entrepreneurs to look at potential deals as they arise. One approach

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being attempted is to package several technologies from which experienced entrepreneurs could select. Some organizations provide a technology showcase of the most promising technologies they're working with, where the entrepreneurs can attend, hear multiple pitches, see which one they connect with best, and see if there are natural matches.

Practitioners have employed a number of methods to identify experienced entrepreneurial management. First, they stay connected with their successful "home grown" entrepreneurs, remaining on the lookout for new opportunities for those individuals to become serial entrepreneurs by taking on management of new enterprises. Second, they constantly utilize their networks to identify potential mentors and managers. Networking events and awards banquets can attract the interest of these individuals, or of people who know qualified individuals and can connect practitioners to them.

Practitioners related many anecdotes of successful entrepreneurs who had relocated to their community because of some affinity for that community. Often the affinity lies in family ties. Either the entrepreneur or their spouse grew up in the area and is looking for an opportunity that would allow them to return. Sometimes family circumstances – aging parents, for example – cause the entrepreneur to return to the home community, and once there, look for new ventures where they can put their talents and money to work. Some entrepreneurs have a strong connection to the university from which they graduated, and might be interested in taking a university-developed technology and turning it into a new business.

As a result, a number of practitioners see affinity groups as good places to search for experienced entrepreneurs. In particular, several TBED organizations have begun working with university alumni associations in their states to identify and contact high potential individuals who might return home (or at least invest there) if presented with attractive opportunities.

Growing entrepreneurial talent: business plan competitions

One method to increase deal flow is to increase the number of potential entrepreneurs and deals. A popular approach is to sponsor a business plan competition, and based on research, there is good reason for that. A study sponsored by the Kauffman Foundation's Center for Entrepreneurial Leadership and conducted by Alberta Charney and Gary Liebcap from the University of Arizona, found that college students who had graduated from business school with a degree focused on entrepreneurship education that culminated in a business plan competition:

- Were three times more likely to be involved in the creation of a new business venture than were their non-entrepreneurship graduates;
- Were 11% more likely than were non-entrepreneurship students to own their own businesses after graduation;
- On average, earned an annual income 27% higher than non-entrepreneurship graduates;
- Accumulated 62% more in personal assets after graduation than non-entrepreneurship counterparts;
- Were 9% more likely to be associated with developing new technological products;
- Had a 13% greater chance of being involved with a high-tech firm.¹⁸

Business plan competitions are being employed as vehicles to attract and train potential entrepreneurs and ferret out latent ideas for new enterprises. However, some of those interviewed pointed to other side benefits in conducting business plan competitions, including:

- The competitions can serve as a source of leads for TBED organizations that provide services to entrepreneurs, and then provides an opportunity for the TBED organizations to connect the competitors with resources that may be able to help the potential entrepreneur. For this approach to be successful, though, there must be an active, hands-on approach to working with the competitors, so the competitors see the value in working with the TBED organization.
- If the business plan competition receives public attention, it can help change



the region's perception of entrepreneurship—encouraging those who normally would not have explored entrepreneurship as a career path to consider a different direction.

Business plan competitions may focus on existing entrepreneurs and start-up businesses, or they may be aimed at college students.

Example

Great Lakes Entrepreneurs Quest. The Quest is a volunteer-driven organization involving members of entrepreneurial communities from across the state of Michigan. Its organizers represent the diverse elements of Michigan's entrepreneurial community: academics, angel investors, lawyers, CPAs, public servants, VCs, corporate execs, universities, economic development experts, foundations and other entrepreneurs. They serve on the board of directors, raise funds, design training, prepare coaches, publicize and promote the competition, recruit sponsors, develop the criteria for evaluation and judge the business plans. Quest participants are eligible to compete in one of two business plan competitions: New Business Ideas or Emerging Companies. Competitors have the chance to win seed capital and valuable services (e.g., legal, accounting, consulting) and other opportunities that can help entrepreneurs launch or grow a business.

With an annual budget of approximately a half-million dollars, the competition has seen approximately 500 teams, or prospective companies, compete so far. One of the things practitioners judged most valuable about the program is the mentoring and coaching that occurs. Each qualifying team gets a coach and mentor at no cost.¹⁹

Example

Oklahoma's Donald W. Reynolds Governor's Cup Competition. Fifty-two teams of graduate and undergraduate students from fifteen different campuses entered Oklahoma's 2005 Donald W. Reynolds Governor's Cup Business Plan Competition.

The competition was modeled after the Governor's Award for Entrepreneurial Development program in Arkansas, managed by the nonprofit Capital Resource Corporation. Twenty-seven student teams and their faculty advisors have been awarded \$374,000 in cash prizes since the Arkansas competition began in 2001. With a grant from the Las Vegas, Nevada-based Donald W. Reynolds Foundation, annual competitions are held in Arkansas, Oklahoma and Nevada. Within several years, an annual tri-state championship competition is planned. Students involved in the competition gain access to networks of successful entrepreneurs, lenders and investors, teambuilding opportunities, business planning skills, and media exposure.

Organized and managed in Oklahoma by i2E, Inc., the annual competition is open to all faculty-sponsored, full-time and part-time undergraduate and graduate students enrolled at any of Oklahoma's universities or colleges. The business plan must be for a seed, start-up or early-stage venture and must address the entire business concept (including implementation). At least one team member must have a key role in the company's management team.

The organizers' purpose for the competition was to encourage students to act upon their ideas and to promote the development and commercialization of technologies being discovered in Oklahoma universities.

Venture capitalists, business leaders, and entrepreneurs acting as judges rate each business plan and select six graduate finalists and 12 undergraduate teams to advance to the semi-final round. The semi-finalists present their business ideas to another panel of judges who select the finalists. The finalists then compete in an oral presentation to determine the first, second and third place winners, who are announced at a gala Awards Luncheon.

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Undergraduate and Graduate teams compete separately for \$104,000 in cash awards. First place of each division receive \$20,000, with \$10,000 going to the second place winning teams, and \$5,000 to the third. Faculty advisors of the semi-finalist and finalists are awarded \$500, an additional \$1000 if their team placed second or third and \$1500 for first place.²⁰

Pulling technologies out of corporations

Some organizations – particularly those in larger states with access to the corporate headquarters of large, R&D intensive companies – seek to increase deal flow through activities designed to pull technologies out of private companies, particularly dormant technologies that have some commercial value but may not fit with the current business model for the company.

Practitioners reported that downsizing at a large corporation often generates opportunities to spin out new businesses. Individuals who left the company may have worked on certain technologies and had in-depth knowledge of their potential. With the application of angel money for these spin-outs, dormant technologies that might have died within the companies but for these individuals may instead form the basis of viable new companies.

One practitioner described his approach for mining large companies for technologies. He said that he establishes relationships and meets regularly with large companies to assess not only how they are doing presently, but whether they have opportunities for sponsored research within universities or licensing of technologies from universities, and/or orphan technologies sitting on the shelf with potential to be funded. He does the necessary research ahead of time to determine likely targets and opportunities for discussion. Through this proactive approach, he reported that opportunities for technology transfer may be identified that otherwise would never have happened.

Another practitioner saw a strong role for incubators in this process. His recommendation was to get the technologies out of the companies and into sponsored incubators with management talent willing to make the commitment and investment to commercialize those technologies.

Example

National Institute for Strategic Technology Acquisition and Commercialization (NISTAC) Technology Acquisition Development and Commercialization (TADAC) Program

Founded in 1994, the National Institute for Strategic Technology Acquisition and Commercialization (NISTAC) is a not-for-profit, 501(c)3 corporation, organized under the auspices of Kansas State University (K-State) and the State of Kansas via the Kansas Technology Enterprise Corporation (KTEC). K-State is the state's Land Grant Research University located in Manhattan, a city of 50,000 people in a regional community, which includes approximately 100,000 people in a 35-mile radius. KTEC is a statutory, economic development corporation reporting to the Governor. Originally named the Mid-America Commercialization Corporation (MACC), NISTAC also is co-sponsored by the City of Manhattan, Kansas, and the Manhattan Area Chamber of Commerce.

The TADAC Program transfers technologies from large corporate urban environments into rural and other regions for economic gain. Co-sponsored by Kansas Technology Enterprise Corporation and K-State, TADAC was established in 1998 as a pilot program with the goal of unleashing the national security and regional economic benefits to be found in the unused portions of the patent portfolios of large corporations.

Under the TADAC Program, NISTAC has acquired a substantial portfolio of nearly 1,000 donated patents and patent applications from more than 50 received donations. Donations were primarily acquired through unsolicited offers.

In mid-2004, the Mid-America Commercialization Corporation's (MACC's) name was changed to NISTAC as a signal that the reach of MACC's programs



was being broadened beyond Kansas to include regions throughout the nation. This expansion primarily is being done through the creation of a national network of cooperating not-for-profit entities with complementary missions. Such entities include universities, research institutions and regional economic development organizations.²¹

Pulling technologies out of universities

Many commercialization centers and incubators were initiated with the primary mission of commercializing technologies generated by associated or nearby universities. Practitioners from many of these organizations who were interviewed for this guide report that, over time, in order to increase deal flow, they broadened their clientele to include entrepreneurs and companies not affiliated with the university.

Nonetheless, universities are still recognized as important technology generators, and there is much more on this topic on the preceding section of this guide. In order to forge a good working relationship with universities, practitioners interviewed emphasized that commercialization centers need to recognize the universities' needs and help address those needs. Often times, they observed, if the commercialization initiative has money to invest, this makes partnering more attractive to the university.

Most universities recognize that while they may be very proficient in research and in technology transfer, they generally do not have a depth of experience in commercializing technology. When commercialization programs demonstrate to the universities that they can add value and make the universities more successful at commercializing university-developed technology, universities will be more willing to engage with them. More details on these programs can be found in the preceding section of this guide.

Example

Several years after its initiation, **Utah's Centers of Excellence Program** added a consulting program to the centers program, in which each time a center was selected for funding, a professional independent business consultant was assigned to that center. The business consultant's responsibility is to work with the principal investigator to develop commercialization strategies and look at productization, target companies for licensing, and perform competitive analysis. According to program officials, the program has increased the number of center technologies that have been commercialized.

The consultants are paid out of the state dollars appropriated for the Centers program. The program currently budgets \$8,000 per center for the commercialization program. The funding for the consultant is awarded to the center, and the actual contract is between the consultants and the university tech transfer office. There is a strong emphasis on doing the deal in Utah if it makes sense to do so.

Entrepreneurial programs within universities

Entrepreneurship education programs are proliferating in higher education institutions nationwide. "Whereas 15 years ago only a handful of schools offered courses in entrepreneurship, today more than 1,500 colleges and universities offer some form of entrepreneurship training. There are currently more than 100 active university-based entrepreneurship centers in the U.S. and more than 270 endowed positions in entrepreneurship, an increase of 120 percent in just the last five years."²²

Entrepreneur Magazine publishes an annual listing of its "Top 100 Entrepreneurial Colleges." It organizes its listings into three categories of programs: Comprehensive (offering the widest variety of resources), Entrepreneurship Emphasis (a smaller number of entrepreneurship faculty, courses and initiatives), or Limited Curriculum (only a few faculty teaching a limited number of courses.)²³

The magazine points out that entrepreneurship education is distinct from a general management program because entrepreneurs need skills that most general management students do not. Among those skills are:

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- Risk management
- How to raise capital
- Opportunity recognition (learning to seek profit rather than protect resources)
- The ability to handle failure and persist²⁴

University entrepreneurship programs may even offer students access to capital, bringing in private equity investors to talk to students. Those conversations sometimes result in funding. Most programs also stress experiential learning, where students take internships in operating companies.²⁵

Example

Dingman Center for Entrepreneurship

Located at the University of Maryland Robert H. Smith School of Business, the Dingman Center for Entrepreneurship helps students and regional entrepreneurs develop and grow their businesses through a variety of services and programs. The Dingman Center uses its strategic position within the Smith School to leverage resources from the entire university to assist enterprises.

Two full-time professional staff, ten Dingman scholars, three entrepreneurs-in-residence, and two senior fellows manage the Dingman Center. A Board of Advisors, comprised of area business leaders, meet several times a year to guide the Dingman Center in its strategic planning.

Programs for student entrepreneurs include The Dingman Process, Pitch Dingman, Entrepreneurs-in-Residence, Academic Programs, and Volunteer Activities. The Dingman Process helps students and regional entrepreneurs systematically analyze and develop businesses. Through Pitch Dingman, students are invited to pitch their business ideas to the Dingman Center in order to gain feedback from experienced entrepreneurs and potentially receive support and resources. The Entrepreneurs-in-Residence are successful entrepreneurs who volunteer their time through networking events, panelists, and one-on-one student advising. Dingman Center's Academic Program supports educational programs in entrepreneurship at the graduate and undergraduate levels.²⁶

Example

Hinman Campus Entrepreneurship Opportunities (CEO) Program

Founded by the University of Maryland A. James Clark School of Engineering and Robert H. Smith School of Business, the Hinman CEO Program is offered to undergraduate students interested in entrepreneurial ventures. Hinman CEOs experience a living-learning culture through designated residence halls designed to encourage exchange of ideas. Students are required to live in the specially designed residence halls that feature an incubator environment with state-of-the-art technology, meeting rooms and computer labs. Additionally, students have access to outside business contacts and mentors.

Students participate in a host of education activities during their tenure in the program. The A. James Clark School of Engineering offers a unique entrepreneurship course, which focuses on technology entrepreneurship and covers topics such as idea generation, feasibility, protection of intellectual property, marketing, forming teams, and organizations forms. Students form teams, write business plans, and present them to the class. The Hinman CEOs Program also manages the annual University of Maryland Business Plan Competition that allows students and recent alumni to compete for prize money that will enable them to start businesses. Hinman CEOs are encouraged to compete in the competition.

The Hinman CEO Program seeks active, high-achieving students. A semester review of academic performance as well as the progress toward program goals can be conducted at the discretion of the program. Students are encouraged to develop a business idea and write a plan while in the program. To provide mentoring on business planning, marketing strategies and financing, coaching is available for Hinman CEO teams. The Office of Technology Commercialization and Office of Information Technology



provide advice on intellectual property, while other internal and external partners provide mentoring on legal issues.²⁷

PROMOTING A CULTURE OF ENTREPRENEURSHIP

The environment for entrepreneurship varies widely among communities across the country. Why exactly that occurs is not clear, but a region's demographic makeup, history, corporate composition, employment history, and the priorities of its political leadership all may play roles in shaping how accepting a region is of entrepreneurship and whether an entrepreneurial culture (i.e., a culture that embraces and encourages risk taking) develops. Statistics on business churning, a measure of new firm births and existing firm deaths as a share of total firms, serves as an indicator of a region's entrepreneurial culture; a higher churn rate indicates a stronger entrepreneurial culture. Among those interviewed were several who came from areas with very low churn rates, and they tended to cite a combination of history and corporate composition of traditional manufacturing with a risk-averse culture where there is a very low tolerance for the inevitable failures associated with entrepreneurship as the causes for a lack of entrepreneurial culture.

For these reasons, practitioners interviewed advised that those seeking to support the growth of entrepreneurship must take deliberate steps to encourage development of an entrepreneurial culture by driving quality deal flow, encouraging angel investors to invest locally, educating the media and community leaders, and recruiting high profile entrepreneurs to act as role models, champions and spokespersons.

Interviewees cited several factors that, in their experience, contribute to a vibrant entrepreneurial culture. They include:

1. A spirit of risk-taking

In some communities, practitioners said, "failure is a punishable crime." In other places, they said, "venture funds look upon failure as the best predictor of success. Someone who has failed knows what not to do in the future."

A spirit of risk taking recognizes that failures are to be expected on the road to success. While risk-taking carries with it the real possibility of failure, there is widespread acceptance that failures are learning opportunities, and that it often takes big risks to generate big rewards. The more pervasive and endemic this attitude is, the more hospitable the environment for entrepreneurship. In contrast, a region where risk-taking is instinctively frowned upon and failure is considered shameful presents very rocky soil for starting and growing innovative new companies.

2. Angel investment activity

"What people mean when they say that there is a good entrepreneurial culture in a community or region is that there are mechanisms in place through which people can find quality investment opportunities and those investment opportunities can find people." That is how one practitioner summarized the importance of investment activity to a positive entrepreneurial culture.

A region can have active networking organizations and technology councils, but still be missing a critical element: the region may be lacking a cadre of angel investor entrepreneurs – serial entrepreneurs who have money and experience, and who can act as the effective connectors between researchers and venture capitalists.

The scarcity of seasoned serial entrepreneurs available to act as angel investors and/or professional managers was cited by practitioners interviewed for this guide more often than any other issue as a serious challenge to building their entrepreneurial cultures.

Further, one sign of the health of an entrepreneurial culture is the extent to which local investors who are active invest their money locally versus investing it elsewhere.

3. Entrepreneurial faculty

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Strong entrepreneurial communities often have academic institutions with top-notch researchers who are also entrepreneurially-minded. The degree to which faculty are encouraged by their institutions toward, rather than away from, commercialization is usually a strong contributing factor to the degree of faculty entrepreneurship.

4. Strong support infrastructure

Strong entrepreneurial communities have a depth of skill sets resident in the community to support entrepreneurs. These skill sets may consist of everything from professional services such as legal and accounting, to manufacturing capability.

5. Entrepreneurial corporate culture

Large, technically-oriented corporations may generate populations of intellectually aggressive and aware kinds of people within a community, contributing to a positive local environment for entrepreneurship.

The degree to which a corporation, or federal or non-profit laboratory, spins-off new companies depends in part on whether the entity promotes an internal culture of risk-taking. When the corporation is the dominant employer in a community, the internal culture of risk-taking or aversion to risk can seep out into the broader community and significantly affect the public's attitude toward entrepreneurial enterprises.

Conversely, while communities with large corporate headquarters often benefit from the depth of private sector financial and management resources they bring, a prevalence of well-established, large corporations can also foster a very conservative business culture. The assumption that private resources are available for start-up companies may also result in a scarcity of public funds available for this purpose. One Midwestern state was described by an interviewee as having one of the lowest percentages of start-ups in the country, but one of the highest numbers of companies that succeed once they start up. The practitioner commented, "Nobody starts anything here on the fly."

The entrepreneurial environment may vary with business and economic cycles. Some events that at the time seem negative can ultimately generate positive outcomes. For example, practitioners from one state discussed how a number of the large computer and software firms that originated in that state ended up moving out of state because of the critical mass of similar types of companies that existed elsewhere and the lack of capital within the state at the time to keep them in the state. However, one interviewee said, "The good news about that is that when the big trees fall in the forest the saplings start to grow and I don't think there has been anything that's happened in [the state] that has encouraged entrepreneurship more than the demise of some of these companies." New companies grew up around individuals who had formerly been with larger companies that did not want to leave the state. In some cases, as in this state, when large companies downsize or lay people off, a base is created for heightened entrepreneurial activity.

6. Community support

The role of strong, individual leaders can be critical to keep the community energized. When one individual is perceived as providing the leadership that is stimulating entrepreneurial development activity, the loss of that individual can have a profound effect on continued progress. Many practitioners cited the names of specific governors or corporate leaders they associated with being the catalyst for the development of a robust entrepreneurial culture in their area. "There needs to be some political will or driving force for these things," one practitioner observed. Consequently, some practitioners strongly recommended recruiting support from high-profile community leaders and keeping community leaders involved to help drive progress in the region.

A number of practitioners commented that while a state can fund programs to support entrepreneurship that local buy-in and support of those initiatives was critical to their success. This local support is not only important from a monetary viewpoint, but also as a means of integrating the program into the



fabric of the community, which ultimately will lead to greater success for the entrepreneurs being served.

Helping private sector business leaders grasp the vision of why they should invest in efforts to grow the local innovation economy can be challenging, however. One practitioner observed, “Technology-based companies are saying, if you have somebody in the incubator who is going to produce a technology that we might potentially license and develop, then we are interested in making a contribution or investment to you. Otherwise, we’re not. And the non-tech companies are saying, ‘What’s in it for me?’”

The key, according to several practitioners, is to educate key players in the community, and develop a consensus for, the need to support entrepreneurship. Those that had been successful said that the entrepreneurial climate was strengthened when business leaders, chambers of commerce, universities, the investment community, elected officials and government agencies – are all “singing off the same page” in recognizing and encouraging support for innovation entrepreneurs.

As with most important quests, interviewees said that a successful effort hinges on the right people and sufficient resources. One practitioner with multi-state experience advised the following:

“First, start identifying who the entrepreneurial leaders are who can influence a paradigm shift or culture change within a region. They need to be added to boards of economic development organizations, angel groups, commercialization corporations, and so forth so the word can be spread...

“Identify leaders who will be involved at the state level because education within the state legislature, with a governor, and with governors’ administrations is extremely important. It’s not that the efforts need to be government led, but the government can act as catalyst and can be a major funding source....

“When it comes to changing the entrepreneurial culture, it can be influenced, but no one can dictate that it happens – much of the strategy is simply leading by example. For this reason, it is important to find a champion, a stakeholder within the region that people can get behind. Evaluate the needs, find the right people to address them, and if the right people are not there, import them into the region.”

7. Communications and branding

Communities can help build a robust entrepreneurship environment through strategic communications efforts. Creating and communicating an effective branding message about the community’s entrepreneurial climate and its core competencies can not only contribute to attracting more entrepreneurs from outside the area, but also (and, perhaps, more importantly) help change the mindset of the community. In crafting its message, practitioners advised that a community might benefit most from focusing on a core set of competencies rather than trying to be, or sell itself as, “the entrepreneurial place for everything.” As with all successful marketing campaigns, the message must be credible; trying to brand a community as the technology entrepreneurship hotspot when there are few tech entrepreneurs in residence will result in failure.

8. Informed media coverage

Another factor that several practitioners pointed to is the tone of the local media when covering business start-ups, failures, and the overall state of the local economy.

The media can contribute significantly to a positive or negative entrepreneurial culture. Practitioners report that in some communities the media tends to focus on bad news and overlook the good news. In these instances, the media focus on what has been done that has not worked, versus on what might be done to improve things. They focus on businesses that fail rather than start-ups that succeed. This approach to reporting, in turn, shapes and reinforces the community’s image of itself, and the image it projects to others.

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In the practitioners' experience, when it comes to entrepreneurship, the media does not always distinguish between traditional small businesses and technology-based businesses. They have found it necessary to educate reporters to the unique needs and challenges faced by technology entrepreneurs. They say the media need help to understand the difference between "wealth creating" and "wealth circulating" businesses.

Fostering good relations with key media outlets, educating them about entrepreneurship, and actively identifying for them entrepreneurial success stories to publish were reported by practitioners interviewed to be as essential to helping improve media coverage. Practitioners advised cultivating good relationships with the press at all levels in order to get their attention when needed, being proactive with positive press releases, and helping to make the press feel like they are part of the process.

Conclusion

Entrepreneurs by definition are aggressive, innovative, energetic risk-takers. By contrast, conventional wisdom says that government is slow, methodical and risk-averse. Yet government policy makers at all levels are coming to recognize entrepreneurs as a vital force in our nation's economy, key to our ability to remain globally competitive. Further, they appreciate entrepreneurs' critical role in creating and sustaining thriving local economies. "Innovators break the rules," observes former NSF Deputy Director Joseph Bordogna. "It may be a leap of faith to trust them," he advises his colleagues in government, "but trust them we must, or we suffer the quagmire of the status quo."²⁸

For this reason, state and local officials have begun "placing their bets" on entrepreneurs, investing public dollars in assistance programs to help innovative new companies start up and prosper. In order to assist entrepreneurs, government agencies themselves have had to learn to act entrepreneurially, looking for creative ways to meet market demand and innovative programs that consistently deliver the most impact for the taxpayer's dollar. In order to work effectively with both entrepreneurs and private investors, they have had to find ways to meet the private sector on its own terms, with flexibility and with savvy, well-paid staff.

Practitioners interviewed for this guide offered a variety of suggestions and advice. The advice, generally, fell into one of three areas: philosophy and approach in implementing programs, the organizational structure of programs, and operational details of running these kinds of programs. As with all of the observations and advice offered by those interviewed, these are the authors' summation of what appeared to be a consensus among those interviewed; they should not be viewed as being unanimously endorsed by all interviewed.

In the philosophy and approach in implementing programs, advice that was given included:

- When getting started in creating programs, examine the entrepreneurial climate, the infrastructure in place to support entrepreneurs, and then devise ways to fill the gaps. To ensure the greatest chance for success, entrepreneurs must have access to a comprehensive continuum of programs as they progress through the stages necessary to establish a thriving enterprise.
- Don't look for a cookie cutter approach – there isn't one. Methods and service delivery mechanisms that work well in one location may not work well in another due to differences in local politics, infrastructure, resources and entrepreneurial culture.
- Entrepreneurship assistance initiatives should be integrated into the overall state or regional economic development infrastructure. While a variety of private entities may have resources designed to help start-up companies, one observer notes, "When it's not embedded in the economic development infrastructure it's difficult to understand it, to manage it, [and] to allow it to be leveraged with other resources that economic development has control of."

- Community support for entrepreneurship initiatives is important. The state can provide some funding, but local buy-in is critical because ultimately the businesses that are being created and growing must be sustained from local conditions. The entrepreneurial climate will be strengthened when the key players in the community – business leaders, chambers of commerce, universities, the investment community, elected officials and government agencies – all recognize and encourage support for innovation entrepreneurs.
- Policymakers should be prepared to wait for results from entrepreneurship programs. Communities seeking to grow their own base of entrepreneurs should expect to wait 10 to 30 years to see real impact from this strategy. One practitioner put it this way, “It is important to have a well-funded initiative, because change doesn’t occur overnight. It might take 5-10 years to see even subtle changes that occur within cultures and regions.”
- Do not expect programs to be self-sufficient. With only a few exceptions, most programs do not achieve self-sufficiency (i.e., they can pay for their operations without any public funds) and still meet their economic development mission. A few practitioners noted there is a significant difference between sustainability (i.e., an organization is able to develop a variety of funding sources to achieve long-term stability) and self-sufficiency. Government-initiated economic development programs should focus on sustainability rather than self-sufficiency.
- To be effective, organizations must have a high level of credibility with both entrepreneurs and investors. This credibility will permit the organization to build the network of resources that entrepreneurs need to succeed and to effectively promote a culture of entrepreneurship.

In considering the organizational structure, practitioners advised:

- Try to form partnerships with local respected organizations. Not only will this leverage limited funding, but also provide a more seamless system for entrepreneurs and provide a broader reach for all organizations.
- Expect that the larger the population area, the more difficult it will be to create a “one-stop shop.” Additionally, larger states – particularly those with several large MSAs – generally take a more regional approach to service provision to accommodate different industry sectors, needs, and entrepreneurial cultures, and ensure that service providers and entrepreneurs are within easy commuting distance of one another.
- Place heavy emphasis on getting the right board members because engaged community leaders drive progress. Organizations that have established a positive reputation in the community and have influential board members or supporters can use their influence to help change the entrepreneurial culture in their area.
- Unlike most other tech-based economic development organizations, for those working in the area of entrepreneurship volunteers are critical. They can serve as mentors, trainers, and advisors to those needing assistance. Additionally, they can provide a network to other resources that will be helpful to the entrepreneurs.

Interviewees cited specific points to consider when running programs focused on entrepreneurship:

- Quality leadership is the most critical factor in the success of a TBED entrepreneurship support program. These leaders must understand the “real world” for entrepreneurs and their start-up companies. They must be committed and willing to devote the necessary time to nurture the new enterprises. They must have the savvy to assess both the needs and the potential of the companies, and to know when to stand firm versus when to be flexible in working with them as circumstances change. Managers must have the ability to:

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- Build partnerships
 - Develop network of resources
 - Relate to entrepreneurs and investors
- In order to get quality leadership, TBED organizations must find a way to pay these individuals competitive wages. This is another reason that public sector TBED organizations often contract with private entities to provide these services.
- Programs that have control of money to invest may have a better chance of accelerating commercialization in their region.
- Attracting experienced entrepreneurs and professional managers to their region is the single biggest challenge cited by most interviewed. Serial entrepreneurs are essential to manage start-up companies and establish cadres of angel investor entrepreneurs and mentors for new companies. Evidence of active deal flow is critical to attracting this management talent.
- Communities can help build a robust entrepreneurship environment through effective communications. Creating and communicating an effective branding message about the community's entrepreneurial climate and its core competencies can be key to drawing in more entrepreneurs from outside the area.
- States and communities must educate the media and recruit leading entrepreneurs to act as champions and spokespersons as means to encourage development of an entrepreneurial culture.
- A directory of programs not only facilitates access to services by entrepreneurs, but also can bring service providers together and demonstrate to the rest of the world the breadth of resources available in a region.

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² Advanced Research Technologies, p. 1.

³ Ibid, p. 5

⁴ Josh Lerner, "When Bureaucrats Meet Entrepreneurs: The Design of Effective 'Public Venture Capital' Programmes," *The Economic Journal*, 112 (February), pF82.

⁵ Lerner, pF76.

⁶ Nikki Foster, "Entrepreneurship in Rural Communities: An Emerging Strategy Presents Opportunities and Challenges," in *Community Dividend* (Federal Reserve Bank of Minneapolis: Minneapolis, MN), available at <http://minneapolisfed.org/pubs/cd/01-2/entrepreneur.cfm>, accessed 30 August 2006.

⁷ North Iowa Area Community College, available at <http://www.niacc.edu/pappajohn/pappajohncenters.html>, accessed 30 August 2006.

⁸ Marvin J. Cetron and Owen Davies, 53 *Trends Now Shaping the Future*, (World Future Society: Bethesda, MD, 2005), p. 9.

⁹ FastTrac, available at <http://www.fasttrac.org/pages/factsheet.cfm>, accessed 30 August 2006.

¹⁰ Ben Franklin Technology Partners of Central and Northern Pennsylvania, available at <http://www.cnp.benfranklin.org/transformations.htm>, accessed 30 August 2006.

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¹² National Business Incubation Association, available at http://www.nbia.org/resource_center/what_is/index.php, accessed 30 August 2006.

¹³ Ibid.

¹⁴ University of Central Florida Technology Incubator, available at <http://www.incubator.ucf.edu/aboutus/index.html>, accessed 30 August 2006.

¹⁵ Advanced Technology Development Center, available at <http://www.atdc.org/overview.asp>, accessed 30 August 2006.



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- ¹⁸Alberta Charney and Gary Liebcap, *Impact of Entrepreneurship Education: An Evaluation of the Berger Entrepreneurship Program at the University of Arizona, 1985-1999*, available at <http://ebr.eller.arizona.edu/research/entrepreneurship.pdf#search=%22Impact%20of%20Entrepreneurship%20Education%22>, accessed 30 August 2006, pp. 5-7.
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Introduction

Access to capital is a critical component to building strong local and regional innovation economies. In order for new technology enterprises to take root and grow locally, sufficient funding at every level, from angel investment to institutional venture capital, must be available and accessible. Among practitioners interviewed, there was nearly universal agreement that gaining access to capital for fledgling technology companies in their regions often presents significant challenges. These challenges stem from a variety of circumstances, including: geographic concentration of venture capital; venture capitalists' fixation on a few key industries; lack of experienced local investors; and increase in the size of the average investment deal and declining interest in pre-seed and seed stage investments. Definitions for investment terms can be found in Appendix B.

Venture capital tends to be more concentrated in specific geographic areas, leaving other areas of the country lacking in the amount of venture capital. According to the PricewaterhouseCoopers *MoneyTree Report™* on venture capital activity, nearly half of all capital invested in 2005 went to firms in Silicon Valley and New England. Silicon Valley alone received 35 percent of national venture funding, and the prominence of Silicon Valley in venture capital investment has increased steadily in the past ten years, throughout the high-tech boom and bust period of the late 90s and early 00s. The remaining investment is concentrated in only a handful of cities, such as Boston, New York, Washington DC, and Seattle. The top ten metropolitan areas for venture funding accounted for 78 percent of all investment in the second quarter of 2006.¹

"Furthermore, private venture funds have concentrated on a few industries: Thus, many promising firms in other industries are not attracting venture capitalists' notice, perhaps reflecting 'herding' by venture capitalists into particular areas"² Perhaps the most notable example of the "herding" instinct was the amount of money venture capitalists invested in e-commerce companies during the dot-com boom. Data from the PricewaterhouseCoopers *MoneyTree Report* for 2005 indicates that biotechnology and software received 38 percent of venture capital invested in the year, which may indicate an over-emphasis on those two technology areas.

Potential local individual investors may be inexperienced at angel investing, or inexperienced investing in specific industry sectors. These "latent angels" thus represent a potential, but untapped, resource.

While the number of individuals that are members of organized angel groups are increasing, there is a larger percentage of latent angels (individuals who have the necessary net worth, but have not made an investment). In Q1-2 2005, 66% of the membership in angel groups were latent angels (as compared to 56% in 2004 and 48% latent investors in 2003). This increase in latent investors over time indicates that while many high net worth individuals may be attracted to the early stage equity market, they have not converted this interest into direct participation.³

Shifts in investment patterns may create gaps in funding at specific stages – the seed stage, for example. The Kauffman Foundation notes that while, historically, a funding gap occurs between investments made by friends and family and the point where venture capitalists will invest, a second gap has more recently emerged as venture capitalists wait till later in a company's development to invest, and prefer larger deals.⁴

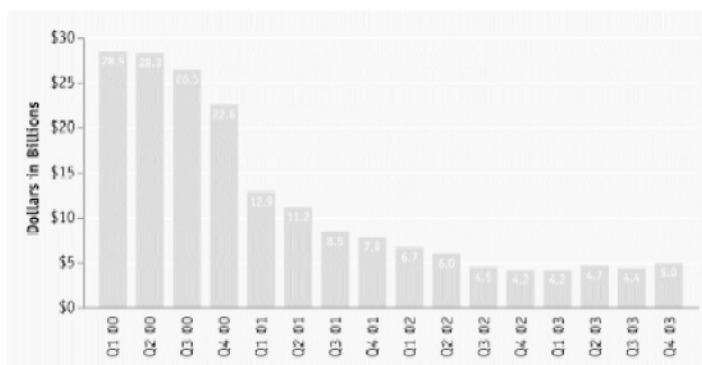
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Added to this problem of venture capitalists preferring larger deals is the definitive drop in venture capitalists funding seed or start-up stage companies. The following table and graphs demonstrate this trend in the last few years of significant decrease in venture capital funds both of numbers of investments and of total dollars invested. The relatively new funding gaps of \$500,000 to \$2,000,000 and most recently also \$2,000,000 to \$5,000,000, combined with the fairly recent precipitous drop in overall venture funding, has created a domino effect of problems for early-stage companies, particularly for companies in late “start-up” or “first stage financing” phases of critical growth and momentum.⁵

TABLE 1
Equity Capital Sources for Entrepreneurs

STAGE	PRE-SEED	SEED/ START-UP	Funding Gaps:	EARLY	LATER
Source	Founders, Friends and Family	Individual Angels	1. Between \$500,000 and \$2,000,000; 2. Between \$2,000,000 and \$5,000,000	Venture Funds	
Investment	\$25,000 to \$100,000	\$100,000 to \$500,000		\$2,000,000/ \$5,000,000 and up	

GRAPH 1⁴
National Venture Capital Investments, 2000 - 2003



Graph 1 Source: National Venture Capital Association

In many cases, angel investors are looked to to fill this gap. However, according to the Center for Venture Research at the University of New Hampshire, angel investors are moving farther downstream with their investments as well.

While angels are not abandoning seed and start-up investing, it appears that market conditions, and the preferences of large formal groups of angels, are resulting in angels engaging in more later stage and follow-on funding for their investments. New, first sequence, investments represent 69% of Q1-2, 2005 angel activity. This shift in investment strategies toward post seed investments reduces the proportional amount of seed and start-up capital. This restructuring of the angel market has in turn resulted in fewer dollars available for seed investments, thus exacerbating the capital gap for seed and start-up capital in the US.⁶

Because of one or more of these factors, representatives of all but a few regions interviewed for this section of the guide perceive and report a shortage of locally-available capital for start-up companies. These same practitioners report that local investors, in turn, often perceive a lack of quality deals, citing that as the primary reason for low investment activity in a region. These investors tend to believe, “if the deals are good, the money will find them.” Definition of “a good deal” always includes good management. However, most practitioners interviewed confirmed that they face a serious shortage of experienced, serial entrepreneurs to provide reliable management for start-up companies. The number of companies that get funded is further constrained by investors’ capacity to screen deals and conduct proper due diligence.



DOES GOVERNMENT HAVE A ROLE?

The question of whether it is appropriate for government to assume a role in providing, or providing access to, capital for start-ups is ongoing. Some see it as unnecessary intervention in the marketplace arguing that if the deals are good, the money will find them, and that government is simply unsuited to the requirements of business investing, lacking the skills, speed, and political will to make correct investment choices.

However, the fact that there are problems in the supply of capital indicates that the market alone is operating inefficiently and as a result may need government action: either by providing incentives to encourage market action or by stepping into the market and offering capital to companies.

Additionally, government may have a role in identifying companies with high economic development potential that have been neglected by the investment community. In some cases it is reasonable to assume that government would be more likely to act than private financiers.

Traditionally, the public sector has employed incentives or disincentives to influence private sector behavior. Practitioners report that state governments have been successful in encouraging and accelerating private investment through use of investment tax credits and by helping to mobilize, educate and organize latent angel investors.

Government can supplement the information and resources of the financial community by pre-screening deals, helping identify qualified management, and providing funds to help companies get to the point that they are attractive to private investors, thereby accelerating and increasing the number of deals that can be done. Practitioners caution, however, that these functions are best performed for government by private intermediary organizations for reasons that will be discussed later in this section.

In summary, the underlying premise upon which technology-based economic developers conduct their work is that, to correct geographically-localized inefficiencies in the market, it is sometimes necessary for government to catalyze action and address market gaps.

As a result, “To serve local entrepreneurs—and in this way create new wealth and quality jobs for their citizens—most states have adopted programs to deliver, encourage, or facilitate the formation of local seed and venture capital resources.”⁷ This section will analyze the most prevalent programs and the lessons learned by practitioners through experience in the field.

Facilitating Capital Access: Overview

OBJECTIVES

Programs involving capital generally have two objectives: economic development and return on investment (ROI).

Virtually all publicly-funded programs seek economic development as an ultimate result. But the degree to which economic development versus ROI is the *primary* objective greatly influences the funding terms, the types of clients, and the performance metrics of these programs.

Is one approach superior to the other? Among practitioners, opinions vary on whether it is preferable to put a stronger emphasis on economic development or ROI. The majority of programs seek a balance of the two that is appropriate to the capital and entrepreneurial environment in which they operate.

Whether a program’s primary objective is economic development or ROI determines appropriate performance metrics. A **ROI-driven program** focuses on the absolute financial returns to the state or region and to the private investors within the state or region. The *wealth* that is generated through the return on investments is assumed to positively impact economic development.

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A program tilted more toward **economic development** includes direct ROI in its metrics, but also looks at numbers of new companies formed within the state, the quality of jobs being created, the number and activity of experienced, serial entrepreneurs being developed in the state, the number and investment activity of angel investors, and the overall amount of equity investment being attracted by client firms.

Given that the number of jobs created has long been a metric in traditional economic development, many practitioners have difficulty educating public officials about metrics appropriate to technology-based economic development. One practitioner said, "When a politician would come to us asking 'How many jobs have you created?' I would usually say, 'With all due respect, you're asking the wrong question. We don't create jobs at all. Companies create jobs so our focus is on creating high performance companies.'" This same practitioner provided the following economic development formula: *A high performance company will create the high performance jobs that lead to a high performance community.*

While reporting job numbers will likely remain necessary in most state-funded programs, practitioners in at least one state found that they could re-focus the interest of legislators on the *quality* of the jobs the companies were creating (i.e., the average salaries as compared to the state's average per capita wages) rather than the *quantity*.

STRATEGIES

The approaches that are employed to improve access to capital for qualified entrepreneurs can be divided into two approaches: encouraging private investment or providing direct funding to firms.

1. Encouraging Private Investment

Because entrepreneurial cultures require the participation of active, robust, self-sustaining private investment communities, states and regions are taking steps to facilitate growth of local investment communities, and encourage increased private and federal investment in local companies, by providing information, education, networking opportunities and financial incentives.

In any given geographical area, one or more ingredients necessary to generate and sustain a vibrant investment environment may be missing or under-developed. If the public sector can help address some of the inadequacies (e.g., lack of federal R&D funding for start-up technology companies; entrepreneurs who lack understanding of investors' expectations; high net-worth individuals who have the potential to invest in local deals, but are not yet doing so; lack of capacity by local investors to conduct the amount of due diligence necessary to do an increased volume of deals; lack of information on the part of local, regional and national venture investors about local investment opportunities; and lack of incentive to invest locally) by catalyzing action on the part of entrepreneurs and potential investors, the hoped-for result is a stronger local investment infrastructure, able to sustain and grow the local entrepreneurial culture.

Encouraging private investment focuses on educating, and stimulating economically productive activity by the private sector (investors and entrepreneurs). If successful, it will result in a self-sustaining entrepreneurial economy, thereby diminishing the need for government intervention over time.

In the near term, however, most initiatives under this approach are very labor-intensive because of the diversity of the constituents served and the barriers to engaging those constituents (e.g., identifying potential entrepreneurs and latent angel investors, geographic distance of venture capital firms, identifying and recruiting experienced entrepreneurial managers, etc.), as well as the amount of education and technical assistance needed. The initiatives may also cost more up front, in part because of the necessity of employing experienced staff – often through contracts with private sector organizations – and paying them competitive, private sector-comparable wages. However, these up-front costs to the taxpayer must be compared against the economic impacts the initiatives generate. If the programs are successful, this leverage ratio will be sufficiently



positive to justify continuation of the efforts until the goal of a self-sustaining entrepreneurial culture has been achieved.

Initiatives

Initiatives that practitioners described to encourage private investment include:

- Entrepreneurship education
- Certification/validation/due diligence/ “brokerage” services
- Angel education – creating smart money
- Angel organization development
- Investor forums and conferences
- Tax credits to encourage investments and pools of funds
- SBIR/STTR outreach and assistance

2. Providing Direct Funding to Firms

To address a perceived gap in funding availability, the public sector may take direct steps to partially fill the gap through direct provision of funds and programs to encourage the private sector to match funding provided by the government.

Whereas the previous approach is primarily one of government facilitating and enabling the desired private sector behavior, direct investing by government itself is more controversial. Under what circumstances should the public sector become a primary source of risk capital to encourage technology entrepreneurship? Considerations include: historically, only one percent of venture capital prospects are funded, and many good deals with economic development potential go unfunded. Additionally, there is spatial concentration of venture capital. There are geographic areas with limited venture capital (sometimes referred to pejoratively as “flyover states”). Many of these areas work aggressively through public sector initiatives to combat their present geographic disadvantage and level the playing field. For example, the staff of public funds can facilitate deal flow for potential investors by doing the due diligence – pre-screening candidates and identifying the most viable deals – thereby increasing chances for the start-ups’ longevity and success. Or regions may incorporate clauses into publicly-funded deals for economic development purposes that enforce geographic restrictions. A final consideration is that public sector programs may invest in industry sectors of regional importance that are overlooked or out of favor by the private equity market, thereby countering the herd mentality in venture capital.

A note about geographic restrictions

As mentioned above, some publicly-funded programs feature geographic constraints as part of the funding contract. Stipulations range from requiring the recipient to agree not to move the company; to agree to remain in the specified geographic area for a specified number of years; or to pay back funds (often with a penalty) if it does move. Because of the need for flexibility to meet the requirements of later-stage, venture capital investors, otherwise qualified applicants may decline to enter into contracts which are too geographically restrictive.

The scenario in which the state invests a significant amount of money to help get a new enterprise on its feet, only to have the company pick up its jobs and potential economic impact and move out of state, presents one of the most difficult political challenges to publicly-sponsored funding programs. This is yet another facet of the TBED practitioner’s ongoing obligation to educate elected officials and policymakers, and to focus them on appropriate program performance metrics. While jobs are important, other factors are wealth creation, the development of serial entrepreneurs, and the growth of a substantial, active local investment community.

One practitioner cites three examples to illustrate this point. In the first, a company into which his organization had invested a great deal of time, assistance resources, and funding grew to the point where it needed significant venture capital. With the TBED organization’s help, the company was successful in raising that capital from tier-one venture firms from outside the state. The investors determined that the company needed a CEO; they hired a CEO out of Florida, and the company promptly picked up stakes and moved there. But, the practitioner points out, “Our mission is creating wealth for the citizens” of the state. “We received a payback on the funds that we invested in that company, so

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that money has gone into other companies. And, the angels and private investors here are likely to make out on that investment."

In the second example, a local company was acquired outright by a large, out-of-state pharmaceutical firm, but created and retained a large laboratory with high paying jobs that stayed in the state.

In the third example, an early-stage software company was developing a technology for the Internet search engine market. The company was purchased by a publicly-traded search engine company; the entrepreneur made good money and used it to start another company within the state.

When educating policymakers about how to measure success of an entrepreneur funding program, practitioners interviewed said that the TBED practitioner would be well-advised to come armed with an arsenal of illustrative anecdotes in addition to statistical data on the amount of private investment attracted, the quality and numbers of jobs produced and companies created.

Positives and negatives to direct funding of companies to consider

One advantage to providing funding directly to companies is that it can get resources into the hands of entrepreneurs more quickly than the indirect process of encouraging growth of a self-sustaining investment ecosystem. Additionally, government funds may be the only funds available to fill financing gaps and enable companies to survive until they are attractive to later-stage investors. Government funds also can be used to reduce perceived risk and thereby attract additional investment by the private sector, and the provision of government guarantees and tax credits may attract in-state activity by out-of-state venture firms.

On the negative side, unless government agencies have employed the services of qualified private sector intermediary organizations, the agencies are unlikely to have staff with the credibility or experience to work effectively with both investors and entrepreneurs and to effectively screen and select promising deals (although there are notable exceptions to this around the country). Government provision of funds invites the possibility of political manipulation. Additionally, policymakers must understand the risk involved, and be prepared for failures. Finally, companies funded by government in the early stages may be moved out of the area by later-stage venture capital investors, meaning that the area will not reap all the economic impact from a successful, growing company.

By using credible, experienced staff, adhering to sound due-diligence and investment criteria, setting rational performance metrics (e.g., wealth creation and the development of a self-sustaining entrepreneurial culture rather than numbers of jobs or companies), and educating policymakers and gaining their support for these measures, the approach of providing direct funding to firms can be successful.

Initiatives

Initiatives that practitioners described to address local capital gaps through the direct provision of funding include:

- Grants or loans for applied R&D
- Funding without taking an equity stake
- Direct equity investment in firms by public sector
- Pension or public funds invested in venture capital funds
- Tax credits direct to firms
- Debt financing for later life

SERVICE DELIVERY

As with the programs discussed in the entrepreneurship section of this guide, service delivery mechanisms vary. The preponderance of programs, however, are now being delivered either by private sector for-profit funds or not-for-profit organizations, on behalf of a public entity, and/or utilizing public funds. While a few programs are still run directly by public employees, most of the practitioners interviewed for this guide found that utilizing a private sector organization provided



distinct performance advantages in addition to those described above. Advantages they cited include:

- It allows for compensation rates competitive with similar positions in business, not government, and therefore sufficient to attract the quality of personnel necessary to do the job well. It also allows employees to be hired on a year-to-year performance basis, and to be offered incentive-based bonuses. In some cases, the organizations themselves take equity in the companies they fund, and employees share in the profit. (Others have made the case for not taking equity, believing that to do so would constitute a conflict, or, at the least, would influence them too much toward ROI rather than economic development-based decisions on selecting and allocating time to clients.)
- It insulates the program from political pressures. Staff can make judgments based purely on the quality of investment opportunities, not on political considerations.
- It allows for more flexibility in dealing with clients in developing term sheets and other negotiating points.
- A private entity is often perceived more positively by both investors and entrepreneurs than is a government agency.

Again, it should be noted, however, that there are some government programs in state economic development organizations where state employees make investment decisions that have overcome these barriers and have proven to be successful.

Initiatives

One outcome of the interviews with the practitioners was a list of approaches that were being used to improve access to capital and a way of thinking how to approach the issue: either by encouraging private investment or providing direct funding to firms. Another way to consider the issue is to keep in mind that TBED practitioners must constantly work on both the supply and the demand sides of the capital equation. They must work to increase the supply of available money, in part by increasing the supply of investors, and to stimulate demand in the form of increased quality deal flow. The following section describes those approaches and, where appropriate, offers lessons learned that might be useful to those considering implementing similar initiatives.

ENCOURAGE PRIVATE INVESTMENT

1. Entrepreneurship Education

One of the most important ways of encouraging outside investment is to promote quality deal flow. The first step in generating sustained, quality deal flow is to cultivate a growing cadre of entrepreneurs who understand the expectations of investors. Specific ideas on how to do that are outlined in the entrepreneurship section of this guide; however, one of the keys is entrepreneurship education. This education can take a variety of forms, including demonstrating entrepreneurship as a career path, training people to be entrepreneurs, or providing one-on-one mentoring of entrepreneurs.

2. Certification/Validation/Due Diligence/Gate Keeping/ "Brokerage" Services

Investors conduct due diligence on potential investment opportunities in order to verify – through interviews, document review, and on-site inspections when necessary – that the businesses in question are more or less what they appear to be and that the investments are consistent with the investors' criteria. However, investors' capacity to scout out, screen and consider deals is limited by factors of time and distance. A recent survey of 121 angel investors and 1,038 individual investments they undertook found that "51 hours were spent in due diligence per investment, on average."⁸

These limitations mean that the TBED organization seeking to link its clients with external sources of funding is in a position to provide a valuable service to

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both investors and entrepreneurs by acting as a funnel, a filter, and a broker of deals for investors to consider. The TBED organization can promote and facilitate deal flow by seeking out and filtering potential deals, validating markets and technologies, conducting a thorough due diligence process, “scrubbing” the most promising deals, and actively presenting and promoting those opportunities to the investment community.

Practitioners advised that the TBED organization will be successful in this role *only* to the extent that it firmly establishes its credibility with investors. “Venture capitalists overwhelmingly tend to favor deals referred to them by trusted sources The reason that venture capitalists take this approach is that they usually know much more about the quality of the source by which a deal was referred than about the quality of the referred deal itself. It makes sense, then, for them to use the quality of the source of the deal, which is well known, as a rough proxy for the quality of the deal, which is not.”⁹

To establish its credibility with investors, practitioners said the TBED organization must:

- maintain a competent, experienced staff with good credentials
- employ a thorough, credible, *consistent* due diligence process comparable to that of a private investment group
- take great care in selecting deals for presentation to private investors
- actively promote itself, its services and its clients to the local, regional, and national investment community.

In order for the client-investor matching process to be successful, the TBED organization staff must also establish a high degree of credibility and trust with the entrepreneur. The process of readying promising entrepreneurs for presentation to outside investors is an intensive, hands-on, personal experience. One practitioner credits the success of his organization in these efforts to the approach the staff takes. “I mean, we roll our sleeves up,” he says. “We’re not always right, but we dig in there and take the philosophy that we’re going to be part of your team for a little while and help you move this thing forward.”

Example

i2E, the company that operates the **Oklahoma Technology Commercialization Center**, employs several methods to screen and evaluate potential entrepreneurial opportunities. First, i2E uses a client questionnaire that is keyed to its copyrighted Commercialization Model shown in Appendix A. The questionnaire asks a series of detailed questions in each of three key activity areas: technical activities, market-related activities, and business-related activities. For example, question number three on the business activities portion of the questionnaire is:

3. Have you developed a strategic business plan?
 - 3.1 Have you finalized the intellectual property requirements?
 - 3.2 Have you finalized the business organizational structure?
 - 3.3 Have you selected a board of directors (or advisory team)?
 - 3.4 Have you finalized agreements on any concurrent break-through?
 - 3.5 Have you developed a formal financial plan that includes the strategy and timing of present and future funding rounds?
 - 3.6 Have you developed a detailed business plan for product development including objectives, schedules, milestones and allocations of the required financial and human resources?
 - 3.7 Can you ensure that management has critical experience and expertise in technology/product/market and business development?
 - 3.8 Have you formed a cohesive commercialization team (design, manufacturing, marketing, management)?

According to i2E, most client interactions require a critical review of the business model. The staff uses a standardized, quantitative evaluation tool to assess the business plan. The business model review provides the client with recommendations and guidance in preparing the written business plan. In some cases a brief market research review is required to obtain a



preliminary assessment of the technology and the business opportunity. i2E contracts with outside resource providers with expertise in information retrieval and analysis to perform the market research. The resulting report provides a brief analysis of the technology, the market, barriers to market entry, and recommendations for further areas of research and investigation.

3. Angel Education – Creating Smart Money

Where there are shortages of seed capital for entrepreneurial ventures, this approach seeks to increase the amount of private investment in play by converting potential or “latent” angel investors into active angel investors through information and education.

Angel investors are wealthy individuals who provide capital for business start-ups, usually in exchange for an equity stake. The availability of angel capital is critical, because it usually constitutes the source of funding after the “three F” (“friends, family and fools”) and before venture capital. In 2005, U.S. angel investors invested \$23.1 billion, according to the University of New Hampshire's Center for Venture Research, more than the \$22.6 billion all venture capital funds reported in the PricewaterhouseCoopers *MoneyTree Report*.

Angels are often interested in investing for reasons beyond financial return. Often successful entrepreneurs themselves, angels seek to mentor new entrepreneurs and stay current on industry trends. In addition to funding, angels may offer valuable management advice and key contacts.

Because they are such a critical resource, identifying active local angels and getting deals in front of them is an important strategy. Yet most of the practitioners interviewed report that the number of *potential* angel investors far exceeds the number of *active* angels with whom they are engaged. According to the University of New Hampshire's Center for Venture Research:

If the angel market is to achieve sustainable growth there needs to be a reasonable augmentation in active investors, and thus, level of participation is an important consideration. While the number of individuals that are members of organized angel groups is increasing, there is a larger percentage of latent angels (individuals who have the necessary net worth, but have not made an investment). In Q1-2 2005, 66% of the membership in angel groups were latent angels (as compared to 56% in 2004 and 48% latent investors in 2003). This increase in latent investors over time indicates that while many high net worth individuals may be attracted to the early stage equity market, they have not converted this interest into direct participation. This lack of active involvement may be the result of the current trend to rush to form angel groups, rather than meeting the more basic systemic need for educational programs and research to move the latent angel to the active investor.¹⁰

In many cases, the reason potential angels are not investing is that they are unfamiliar with the ins and outs of investing in technology deals. As an example, a practitioner explained, “It’s not that the people are risk averse, but the heritage of investment in the state has always been oil wells. If you think about it, an oil well investment is an interesting one, because you pay your money, you drill a hole, and you get an answer: yes, we got oil, I made money; or, no, we didn’t. If the answer is yes, then you start getting paid right away. Contrast that with a venture investment where you put the money in, it’s a long time before you know whether you’ve won or not, and you don’t get paid for a long time. So the profile is very different and it took a long time to get people accustomed to the notion that you could do this and make money at it.”

Most practitioners expressed the belief that an ongoing effort to educate “latent angels” is an essential part of generating outside investment for entrepreneurs.

The approach to angel education varies, it can be informal, or very structured. For example, one practitioner holds quarterly meetings where he brings in an analyst that will look at a specific sector unique to his city to give investors insight into trends in that area. He also has quarterly meetings on investor

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topics related to methodologies for valuation, term sheet development — typical investor topics that stimulate discussion among investors.

Capital conferences, investor forums, and customized meetings offer further opportunities to educate both investors and latent investors on the types of deals available in their areas.

It should be noted that potential angels are sometimes difficult to uncover. Even when identified, angels tend to be independent and private individuals who may not be willing to participate in group education efforts. And providing potential angels with education does not guarantee they will invest locally, or in the organization's client entrepreneurs.

Given this, then, practitioners cautioned that it is important to conduct continuous, aggressive outreach and communications efforts to identify and mobilize investors.

4. Angel Organization Development

Once angels and latent angels have been identified, it is in both the angels' and the state's or region's interests to leverage their investment capacity as much as possible in order to generate the most return on investment and the most economic impact for the area. As the Kauffman Foundation points out in its publication, *Angel Investment Groups, Networks, and Funds: A Guidebook to Developing the Right Angel Organization for Your Community*, "Few individual angels can accommodate the increased dollar needs of growing entrepreneurial companies, particularly in the \$2,000,000 to \$5,000,000 range, before venture capitalists are considering investments, and at a time of critical growth for a young company. But, by combining resources of individual investors, angel groups can be the proverbial white knights."¹¹

While angel groups have increasingly been forming on their own across the country, TBED practitioners across the country have sought to accelerate the trend by assisting angels in their areas to form groups and networks. Their purpose is to catalyze new resources to address the funding gap. "These groups also have the combined manpower for analysis of multiple or complex investment opportunities, further aiding in making these investments possible."¹²

Angel groups are generally local organizations made up of 10 to 150 accredited investors interested in early-stage investing. In 1996 there were about 10 angel groups in the U.S.; now there are more than 200.¹³ In January 2004 the Angel Capital Association was formed under the auspices of the Ewing Marion Kauffman Foundation, bringing together more than 100 of the most active angel groups in the United States.

To facilitate the formation and activity of angel groups, TBED organizations may hold events in various communities in their region designed to identify and educate potential angels about how angel groups work and their benefits. Identifying angels and potential angels around the region can be a slow and laborious process of networking and referrals, as angels have a tendency to guard their privacy. Some practitioners recommended using affinity groups, such as alumni records, and gatherings including awards banquets and networking events to help identify angels.

Once potential angels and angel groups have been identified, the TBED organization may take either an informal or a formal approach to dealing with them. That is, their involvement may range from an agreement to present their group with potential investment opportunities as those opportunities arise, to acting as manager for the organization.

Angel groups can be managed by the members or by a professional manager. Member-managed organizations usually hire administrative support for communications and coordination purposes.

In contrast, a manager-managed (or manager-led) organization employs the services of an individual(s) with experience and background in the



investment process and/or in the industry in which the angel organization intends to focus its investments. Typically, a manager does much of the up-front work of vetting possible deals, conducting initial interviews with companies, coaching entrepreneurs for presentation to the angel group, handling member communications and relationships, and even at times making recommendations on investments and negotiating investments on behalf of the organization.

This manager is not the same as a general manager of a venture capital fund, which has the authority and control over all investment decisions. Instead, an angel group manager manages the group's processes so that the members can focus on making investment decisions.¹⁴

It is rare for a publicly-funded TBED organization to act as manager for a single angel group. TBED organizations have, however, provided various levels of facilitation for angel group formation, and administrative support. TBED organizations may seek to leverage their administrative or managerial efforts by encouraging the formation of angel networks, wherein local angel groups within a region interact and cooperate with each other. Because working with angel groups is labor and time-intensive, practitioners interviewed for this guide recommended that the TBED organization charge appropriate fees for their services.

Example

Washington Technology Center (WTC) Angel Network provides entrepreneurs with access to a statewide network of angel groups, as well as immediate interaction, support, coaching, and resources within their community. The WTC Angel Network was formed as a result of a focus group in six regions that evaluated investment opportunities for start-up companies and indicated a need for a statewide seed capital network.

Entrepreneurs can gain valuable insight through support in coaching and business plan review. They also are provided feedback and support through coordinated statewide efforts with programs such as Eye of the Investor and access to a larger network of angel groups and venture firms statewide. Assistance through the WTC Angel Network includes:

- Advice on navigating investor group formation issues
- Training from experts on due diligence, deal terms and portfolio management
- Support for ongoing management of an angel group
- Help screening potential investment opportunities
- Connections to other angel groups

Angel investors also benefit by belonging to the network. For example, angel investors receive a structure for pre-screening deals; exposure to more deals while maintaining individual privacy; expert insight on potential investments; shared time and expense for due diligence; deal syndication to leverage personal investments; and camaraderie with other business leaders. Angel groups benefit by increasing pre-qualified deal flow referred by similar investment groups, reduced expenses for investment-related professional development, and increased reach for promoting local groups' activities and expanded contact base.

Angel organizations must meet certain requirements to become a member of the WTC Angel Network. Organizations must sign a membership agreement and pay annual membership dues, in addition to meeting certain criteria, which includes a focus on Washington investment opportunities; an established company screening process; an established investor and member screening process; participation in structured ongoing educational programs for investors; and education program attendance for staff or key volunteers.¹⁵

5. Investor Forums and Conferences

When first popularized, investor forums and conferences were intended to showcase promising ventures to an audience of private investors, with the expectation that deals would result. Regional conferences were designed to draw

venture capitalists from outside the immediate area and spur their interest in investing locally.

Practitioners report that these forums and conferences continue to be viable marketing tools to showcase the kind of quality deals being generated in a region. In some parts of the country, investor forums continue to result in deals as do more informal networking events designed to bring together investors and entrepreneurs. However, as the number of capital conferences being conducted around the country has increased, practitioners report a fall-off in attendance by venture capitalists. The general sentiment is that, while the conferences remain viable as marketing tools, the conferences only occasionally result in actual deals being done.

6. Tax Credits to Encourage Investments and Pools of Funds

States have employed creative use of tax credits to build their local investment communities by both encouraging angel investment and attracting outside investment firms.

One practitioner compared states' investments in technical assistance versus tax credits. She pointed out that promoting deal flow through technical assistance is a much larger investment in terms of time and resources, and it does not offer immediate results. Regarding the expectations of policymakers, she observed, "At least with a tax credit you can say, 'Oh, we did it. We can see in a year what happened.' Building that ecosystem of entrepreneurial support is a long-term effort and that's not something policymakers necessarily have on their radar screen."

However, other practitioners noted that simply having a credit does not guarantee success. Awareness and usage of tax credits and, therefore, their effectiveness varies widely. It appears that those states where the credits are used most frequently are those where either the state economic development department or local tech-based economic development organizations are actively promoting the credit and providing assistance in applying for the credit. In some states, the amount of credits is nowhere close to the cap set by the legislature. In these states, it appears that the credits are administered primarily by the taxation department and no one is promoting the credit to those who could benefit from them or the process of receiving the credit is so burdensome it serves as a deterrent in applying for the credit.

Tax credits to angel investors

Because many states feel the need to stimulate a greater volume of private investment – especially angel investment – in local start-up enterprises, they offer tax credits to angel investors to increase the attractiveness of investment by reducing risk. Typically, the incentives offer a credit on the investor's state income taxes (although other tax liabilities may also be reduced) for a percentage of the amount invested in the company. The mechanics of the programs vary from state to state with differences in what kind of companies are eligible, the amount of investment required, the time period required for the investment, and the amount of credits available. Practitioners report that angel-related tax incentives can work in states with income taxes to increase capital availability and help develop a community of angel investors.

Examples

Established in 1996, Ohio's **Technology Investment Tax Credit (TITC)** Program provides a tax credit of 25 percent (or 30 percent in limited cases) of the amount invested for Ohio taxpayers who invest in small, Ohio-based technology companies. The credit may be claimed against personal income tax, corporate franchise tax, public-utility excise tax or the dealers-in-intangibles tax.

Qualified businesses must be involved primarily in research and development (R&D), technology transfer, biotechnology, information technology, the application of new technology developed through R&D or acquired through technology transfer. Companies must meet the program requirements and be approved by the TITC Committee, which is formed by

three members of the Industrial Technology and Enterprise Advisory Council whose members are appointed by the Governor and General Assembly.

In order to qualify for the program, the entity must be a corporation, limited liability company or unincorporated business organization; be located within the state of Ohio and have at least 50 percent of its gross assets located within the state, and 50 percent of its employees located within the state; and have a valid business license in Ohio or be organized in the state.

Once the entity has submitted an application to a TITC Edison Center, then the committee conducts a review. New applicants are encouraged to attend a TITC meeting and present a short presentation detailing how their company meets the TITC requirements. Once approved, the maximum tax credit issued is \$62,500 for any one investor in any one company. The investment must take the form of the purchase of newly issued or preferred stock, a membership interest, partnership interest or any other ownership interest. The equity position must be directly purchased from the entity.

Investors may receive a tax credit of 30 percent if they are investing in an Encouraging Diversity Growth and Equity (EDGE) qualified entity or an entity in a distressed county. The maximum single investment in one company is \$300,000 if the company is an EDGE or Distressed County enterprise, and the maximum tax credit issued is \$90,000. The criteria and qualifications to become an EDGE-certified company include location in a qualified census tract or demonstration of a socially and economically disadvantaged business status.

Ohio law currently authorizes the issuance of \$20 million in aggregate credits. Since January 2005, \$14 million in tax credits have been approved for investments in TITC approved entities.¹⁶

Example

Indiana Venture Capital Investment Tax Credit program was established to improve access to capital to fast growing Indiana companies by providing individual and corporate investors an additional incentive to invest in early-stage firms. Investors who provide qualified debt or equity capital to Indiana companies receive a credit against their Indiana tax liability. The credit is open to any taxpayer who is an individual or entity, including a pass-through entity that has any state tax liability. The maximum amount of tax credits available for the qualified investment capital to a particular qualified Indiana business equals the lesser of: the total amount of qualified investment capital provided to the qualified Indiana business in the calendar year, multiplied by twenty percent (20%); or five hundred thousand dollars (\$500,000). If the amount of credit exceeds the taxpayer's state tax liability for that taxable year, the taxpayer may carry the excess over to the taxpayer's following taxable years.¹⁷

Fund-to-funds Programs

Based on a model pioneered in Oklahoma, states have also used tax credits as guarantees to generate a "fund-to-funds" for investments in private venture capital funds in order to encourage those funds to create a local presence and invest in local deals.

The State of Oklahoma created the Oklahoma Capital Investment Board (OCIB) in 1993 to mobilize equity and near-equity capital for investment in companies with significant potential to create jobs and enhance the economy of Oklahoma. OCIB is an institutional investor, operating as a fund of funds. It contributes to the building of the venture capital industry in Oklahoma by supporting investments in professionally managed seed and venture capital partnerships. The State of Oklahoma is beneficiary of any basis returned or gains created by these investments. Any cash surplus generated adds to the on-going, revolving resource for development finance activities.

OCIB is a trust authority with the State of Oklahoma as its beneficiary. The Board does not invest directly, but instead supports investments by a private entity,

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the Oklahoma Capital Formation Corporation (OCFC). OCFC borrows from institutional lenders with the assignment of the Board's guarantee, and then invests this capital in partnerships with the approval of the Board. The guarantee of the Board is backed by \$100 million of Oklahoma income tax and premium tax credits. In the event OCIB must act on a guarantee commitment, the Board is authorized to raise the necessary cash by selling OCIB tax credits. The sale of the credits will only be as needed, and only in an amount sufficient to meet the guarantee commitment. To date, no tax credits have been sold.

The Board's allocation targets are designed to provide a portfolio of venture funds that in the aggregate provide seed and early stage capital, traditional venture capital, and expansion capital, in approximately the percentages of 23%, 32% and 40%, respectively.

OCIB pursues a market rate of return as the best discipline for using limited resources to generate the greatest economic impact in the state. In the aggregate, the Board's portfolio has attracted private equity investments in Oklahoma firms in the ratio of \$3 to every \$1 contributed by the Board. As of March 2005 the OCIB had contributed \$27.4 million to funds, which have attracted investment of over \$100 million to Oklahoma firms.¹⁸

Since the creation of OCIB, several other states including Arkansas, Iowa, Michigan, Montana, Ohio, South Carolina, and Utah have initiated their own programs modeled after the Oklahoma example, according to OCIB officials.

CAPCOs

Another tax credit approach is one used for certified capital companies, or CAPCOs. The concept originated in Louisiana. In this model, insurance companies receive premium tax credits equal to 100 percent to 120 percent of the amount they loan to or invest in a CAPCO. According to the National Governors Association, while several states are using CAPCOs, "these tax credits are a controversial mechanism for raising capital due to their cost. Opponents argue that safeguards are needed to ensure that most of the investment capital freed up by the tax credit is invested within the state. They also assert that many of the investments are not true venture investments, but are relatively risk-free investments that should not be supported by tax dollars."¹⁹

7. SBIR/STTR Outreach and Assistance

The federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are the source each year of more than \$2 billion in proof-of-concept and very early-stage funding for fledgling technology enterprises. Eleven federal agencies are required to provide the funds by setting aside 2.5 percent of their annual extramural R&D budgets for use exclusively by U.S. small businesses for new product R&D. The program consists of three phases and requires no repayment, no equity sacrifice, and the small business retains most intellectual property rights.

Funding for R&D at the proof-of-concept stage is difficult if not impossible to get from investors. However, companies who compete successfully for SBIR/STTR awards not only receive dollars to conduct their R&D, but also lower their perceived risk for follow-on funding from potential private investors by having their technology proven and their commercialization strategy affirmed. Additionally, several practitioners noted the "halo effect" of having been selected for an award apparently benefits SBIR/STTR companies; investors view their selection as part of the due diligence process being completed for them with the federal technical review giving a stamp of approval to both the quality and potential feasibility of the research. For these reasons, TBED practitioners often incorporate SBIR/STTR as a specific part of a funding strategy for client entrepreneurs.

Beyond start-up companies, manufacturers and other existing companies have found they can use SBIR to fund the R&D required to diversify their product lines. Many states also encourage companies to use federal SBIR dollars as match for state R&D funding awards.



In order for client companies to benefit from SBIR/STTR, practitioners advise that the TBED organization must conduct aggressive outreach and awareness initiatives to make entrepreneurs aware of this option, must educate entrepreneurs on grantsmanship and techniques to compete successfully for federal funding, and provide matchmaking assistance to generate strategic alliances and follow-on funding. Some practitioners also cautioned that emphasis should be placed on companies that have a history of commercializing their SBIR/STTR-funded research rather than on “SBIR mills,” whose primary business model appears to be securing SBIR funding with never any intention of commercializing the research.

To further encourage participation in SBIR/STTR, states may provide financial incentives, which are discussed later in this section of the guide.

Example

The Wyoming SBIR/STTR Initiative (WSSI) is a statewide outreach program designed to encourage participation of Wyoming individuals and small businesses in the SBIR and STTR programs. The Wyoming Business Council (WBC) offers a significant advantage to WSSI participants by making available funds through its Phase 0 Program. Under this program, WBC provides up to 24 awards annually of \$5,000 each to assist small businesses in the preparation of competitive Phase I SBIR/STTR proposals. Any Wyoming small business or individual planning to submit a Phase I proposal is eligible to apply for this funding.

Initially funded by the National Science Foundation EPSCoR Program, the WSSI serves as a model for other states to emulate, particularly low population states. The program was launched in 1996 by the University of Wyoming Research Office and was an immediate success. Wyoming businesses received more SBIR awards in 1996-1997 than in the previous thirteen years combined. As a result, the legislature authorized the WBC to continue funding for the program in 1998. The WSSI and its partners provide outreach through conferences, workshops and one-on-one mentoring.²⁰

PROVIDE DIRECT FUNDING TO FIRMS

Where there is a perceived gap in funding availability, the public sector may take steps to partially fill the gap, and to catalyze the private sector to match funding provided by the government. Publicly-supported funding may be available across the spectrum from grants for applied R&D projects and proof-of-concept funding that help foster later-stage investing by proving the technology and thereby reducing perceived risk to seed and venture stage funding. Funding may be offered in the form of grants – which generally require a match – to contingent liability loans, to convertible debentures, to straight-equity funding.

1. Grants or Loans for Applied R&D

Within TBED organizations there is a long history of providing funding for applied R&D projects. Early on, these programs tended to focus primarily on university, or collaborative university-industry R&D projects, in order to strengthen the R&D infrastructure within a state or region and encourage greater cooperation between companies and universities. Over time, more resources were devoted to funding private-sector applied R&D with awards determined not only on the basis of scientific merit, but also on the strength of the proposed commercialization plan.

Practitioners and investors recognize that it is necessary to keep filling the investment pipeline by developing new technologies with commercial potential that can form the bases of new enterprises. Applied R&D funding programs seek to do just that. TBED practitioners point out that as a group whose technologies and commercialization strategies have passed a rigorous review, these award-winning researchers and companies form a community of interest to potential investors as a source of deal flow. The programs promote the development of new technologies, which may accrue benefits to the state, over the long term, in the form of new enterprises and jobs within the state and licensing fees and royalty revenues to the university and inventors.

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However, this approach can have a much longer-term pay-off, and because it is funding research, it is by its nature somewhat risky since the research may not be successful. As a result, it is more difficult to predict whether the state will see a positive return on any particular project or company beyond the immediate matching dollars attracted under the terms of most programs.

One type of grant program for applied R&D is financial assistance for SBIR/STTR applicants and award recipients. As noted previously, the federal SBIR and STTR programs are the source of more than \$2 billion in proof-of-concept and very early-stage funding for fledgling technology enterprises. In addition to accelerated outreach initiatives, states may help companies utilize this resource effectively by offering financial incentives in the form of "Phase 0" awards to defray proposal preparation costs, and "bridge funding" to address the funding gap that often occurs between Phase I and Phase II of the federal programs.

Phase 0 awards were developed in states that historically had not received many SBIR awards. One obvious step in receiving SBIR awards is to apply for them, and the Phase 0 awards are designed to encourage companies to prepare and submit applications. The awards typically take two forms: either they provide direct funding to a company to help defray the personnel costs involved in preparing the application or provide funding to a consultant who provides assistance to companies applying. There are good arguments for either approach. In funding the company directly, the Phase 0 awards are developing capacity in the company to compete for SBIR funding that will last after the Phase 0 funding has been used. On the other hand, funding to defray the cost of a consultant may permit a higher likelihood of a successful application, assuming that the consultant has a strong understanding of the ins and outs of the SBIR proposal process.

Bridge funding is used in some states to help keep companies and their research teams afloat during a gap between the conclusion of Phase I funding and the start of Phase II funding. For some companies this gap can be a difficult and potentially disastrous time with the company not having enough cash to keep the research team together or, in some cases, for the company to stay in business. The bridge funding may take the form of a grant, a loan, or a grant with payback provisions in the form of royalty payments tied to the successful commercialization of the product. The funding can also serve as an incentive for companies to pursue Phase II awards.

Example

Kansas Technology Enterprise Corporation's (KTEC) Applied Research Matching Fund makes royalty, equity, or convertible debenture investments in innovative technology companies. The maximum total investment is \$125,000 and matching funds of 150 percent are required by the business. Financial returns are then reinvested in other projects.

The program is designed to invest in early-stage Kansas companies that have innovative technologies, potential to create high-paying jobs, and opportunity to create wealth within the company and an ROI for Kansas. The fund emphasizes technology innovation that is beyond early research and the innovation must lead to marketable products or processes.

KTEC, a quasi-state agency funded by the Economic Development Initiative Fund, assesses potential companies based on the following criteria:

- Potentially unique or disruptive innovative growth technologies
- Vision to build a company around the technology and develop prospects for full-scale commercialization
- Desire to pursue and attract follow-on venture or angel funding
- An entrepreneurial spirit with the vision to utilize business and technical assistance when needed

The company also must demonstrate that a considerable market exists and that the project has potential to produce substantial results for the Kansas economy. Funding may be provided to companies working alone or in collaboration with universities, business incubators, or other companies.²¹



Example

Maine Technology Institute's SBIR/STTR Phase 0 grants are awarded on a rolling basis, for up to \$5,000 per proposal. Each grant requires a 1:1 match consisting of actual cash, salaries, staff time, or expenses directly attributable to the proposed project. Funds can be used for direct costs such as: proposal preparation and review, consultant services for preparation of the Phase I or Phase II proposal, costs to gather information (literature search, market research, etc.), in-state travel to develop partnerships for the proposal; printing costs and supplies associated with the submission of the proposal. Proposals are evaluated based on project description, significance of the proposed innovation; technical merit; commercialization potential; personnel qualifications; and detailed Phase 0 plan & outline of Phase I or Phase II plan.²²

2. Funding Without Taking an Equity Stake

While the previous programs have centered on providing funding to firms by helping fund research they are conducting, there are a suite of programs that TBED practitioners offer that provide funding to companies for whatever their needs may be. The programs may offer loans, awards with a royalty payback provision, or an investment in return for an equity position. The form of financing tends to follow the stage of the company or product; grants are more likely to be available for less-established companies still working on research, while operating and seed capital is more likely to go to firms that have a product but are not yet large enough to be of interest to venture capitalists.

By offering various pre-commercialization grants, awards or forgivable loans for working or seed capital, areas seek to improve the quality of deal flow, reduce perceived investment risk in start-up firms in order to make them more attractive to later-stage investors, and help fledgling entrepreneurs survive until they secure those later-stage investments.

When successful, this approach results in companies that are prepared to receive later-stage private investment. In addition, some form of payback either in the form of royalties or selling an equity position create the ability for the state to recoup at least some of its investment and have funds to put back into the program to help sustain it over the long term.

Commensurate with high risk of investing at this very early stage, however, there is a high potential for failure. Furthermore, without the availability of follow-on seed capital (the lack of which most practitioners interviewed indicated was a serious problem in their states), the state may find it has invested in getting companies "all dressed up with no place to go." Thus, otherwise promising pre-seed investments can result in enterprises that are effectively stillborn.

Example

Ben Franklin Technology Partners of Northeastern Pennsylvania (BFTP/NEP) invests in early-stage companies without assuming an equity position. Instead, the program provides financial support in the form of subordinated debt to qualified client start-ups. These investments must be paid back, though the form of repayment differs between individual cases. The returns from successful investments are reinvested in other Northeastern Pennsylvania companies.

Typical awards range between \$50,000 and \$150,000 over the course of three years, and are targeted toward small, unproven firms that are unable to raise seed funds through conventional means. Repayment occurs during a term of eight years, with interest accruing after the end of the funded activities. After eight years, the principal and any non-paid interest are due in the form of a balloon payment. The loan also includes a detachable warrant feature, based on a pre-determined valuation of \$1 million, \$2 million, or \$3 million. The warrant can be exercised in the case of a major liquidity event.

BFTP/NEP helped 16 early-stage companies in 2005. Investment decisions are made by the BFTP/NEP Board of Directors, based on recommendations

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by the BFTP portfolio team and on input from outside experts. Eligible companies must be early-stage technology firms or established manufacturing firms located in Northeast Pennsylvania. Additional funding is often available through the Northeastern Pennsylvania Angel Network, an associated membership organization composed of more than 2000 private investors.²³

Example

Maryland Challenge Investment Program is an investment vehicle of the Maryland Venture Fund, targeting smaller, early-stage companies in need of seed capital. Unlike the Venture Fund's other program, the Enterprise Investment Fund, the Challenge Investment does not seek an equity stake in its client companies. Instead, state investments are repaid through contingent royalty agreements, which can extend over a ten-year maximum term.

Applicant businesses must be commercializing a new technology through a Maryland-based company with fewer than 25 employees and less than \$1 million in revenue. Applicants must also have a 1:1 co-investor match for all state funds, and be positioned to receive additional outside venture capital. Awards are made based on the project's potential return on investment, market potential, experience and credibility of the management team, viability of the technology, and the potential impact on the state economy.

Initial investments cannot exceed \$50,000, however, incremental increases in increments of \$50,000 are possible, based on the successful completion of mutually-accepted milestones. Companies can receive a maximum of \$150,000 through the program. Repayment is collected through royalties of 2% on revenues over \$500,000, or royalties of 1% on equity raised of \$500,000. These payment are capped at three times the investment made by the Venture Fund.

Since converting from a grant program to a seed fund in 1994, the Challenge Program has invested more than \$10.8 million in technology businesses. Fifty percent of those companies are still in business or have had a successful exit from the program. More rigorous investment criteria were placed on Challenge recipients in 2001. Challenge Investment recipients must now have the potential to become attractive investments for the Enterprise Investment Fund. Since that time, 26 percent of firms have gone on to receive state equity investments.²⁴

3. Direct Equity Investment in Firms by Public Sector

States have been experimenting with direct investment strategies since at least the 1980s, generating both successes and notable failures. This approach seeks to address a perceived insufficiency of local investment capital at one or more stages of investment, and/or for specifically targeted industries. It endeavors to achieve a balance between prudent fund management in terms of achieving acceptable return on investment, and economic development goals in the form of successful new companies offering quality jobs.

One of the key advantages of direct-equity investment programs is the ability to target local industry sectors that have high economic development potential but that have been overlooked by venture capitalists. One of the practitioners interviewed pointed out that some companies may prove to be solid performers from an economic development perspective (i.e., creating high-quality jobs in an area or industry that needs the jobs), but could be below the financial returns that private sector venture capitalists expect. With direct-equity investment in firms, areas can provide the financing these companies need and reap the economic development benefit. Plus, a successful track record can also demonstrate to private investors that the region has deals that are worth considering.

In addition to these advantages, programs that involve private investors, (e.g., through requirements for private sector match on investments), offer the potential to increase locally-available capital, resident fund managers, and more private sector investment.

However, because public money is involved, equity investments by the public



sector have a high profile with more attention from elected officials and the media. Just by the nature of investing in start-up, technology companies, these kinds of programs have the risk of failure associated with them: there are no guarantees that the company is going to be successful, and program managers and their elected officials should be prepared to accept the risk when pursuing this kind of program. A number of practitioners that were interviewed also indicated that it can be extremely difficult to attract and then retain qualified employees to manage the funds with some saying that government salaries can be a significant barrier. Additionally, private sector investors may recruit government staff who have proven themselves to be adept investors.

Finally, strong protections need to be put in place to ensure that politics does not enter into the investment process, which obviously may violate ethics laws, but will also have the potential of affecting the fund's performance and undermining its credibility.

Example

Massachusetts Technology Development Corporation (MTDC) is one of the longest-running state-initiated capital programs in the country. Other than an additional infusion of \$5 million in state funds in 2003, the program has been self-sufficient since its inception in 1978. MTDC President Robert Crowley attributes the program's success to a number of factors, especially the environment in which MTDC operates. That environment includes four significant characteristics. First, the Boston area is home to a robust entrepreneurial culture. In fact, from Crowley's perspective, "Entrepreneurship is simply a fancy word for Yankee ingenuity." Second, Boston has always been a money center. Third, it features a significant technology generator in the form of the Massachusetts Institute of Technology (MIT). And fourth, related to the other three, there is a very well-trained technology workforce in the greater Boston area.

MTDC is set up as a quasi-public corporation. Its board consists of eight private sector individuals appointed by the Governor, and three ex-officio members from the public sector. The staff reviews deals and makes funding recommendations to the board. The board approves deals for funding.

From an initial capitalization of \$8.2 million – \$3 million in federal funds, and \$5.2 million in state funds – MTDC has invested \$62 million in 114 companies.

In spite of the rich environment of the greater Boston area, in 1978, the Commonwealth enacted a law creating MTDC in order to address the capital gap for start-up and expansion of early-stage technology companies.

Though focused on generating positive ROI, MTDC also has an economic development role. Through each phase of its existence, MTDC has pursued the following four basic objectives:

- To help create primary employment in Massachusetts
- To attract and leverage private investment in Massachusetts companies
- To foster the application of technological innovations where Massachusetts companies are, or can be, market leaders
- To nurture entrepreneurship among Massachusetts citizens, planting the seeds for long-term economic development in the Commonwealth

The size of MTDC's initial funding to an applicant is determined by the capital needs of the firm and the investment of the co-investors. Though initial investments can range up to a maximum of \$500,000, most are typically in the \$250,000 to \$500,000 range.²⁵

Example

Connecticut Innovations (CI) was created by the Connecticut Legislature in 1989, which charged it with growing Connecticut's entrepreneurial, technology economy by making venture and other investments. Among

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other activities, Connecticut Innovations makes equity investments in emerging Connecticut technology companies. According to CI's website, since 1995, CI has become the state's leading investor in high technology, investing more than \$133 million in Connecticut companies. Connecticut Innovations' initial funding came from state bonds. But, since 1995, CI has financed its equity investments solely through its own investment returns—not taxpayer dollars.

The Eli Whitney Fund is CI's primary investment fund, aimed at strengthening the state's high-technology environment by providing entrepreneurs with the capital and strategic guidance they need to start and build successful Connecticut businesses. It focuses primarily on technology sectors that present the greatest potential for economic growth - information technology, bioscience, photonics (applied optics), and energy and environmental systems. Investments, which typically range from \$500,000 to \$2 million on the initial round, are made in early-stage Connecticut companies that meet established criteria.²⁶

4. Pension or Public Funds Invested in Venture Capital Funds

Another approach that is commonly discussed in increasing the amount of capital in a region is for the public sector to allocate funds to invest in a privately-managed venture capital fund. In this approach, typically, a public entity (frequently the public pension system) will invest several million dollars in a fund as a limited partner where the managing partner has extensive venture capital experience and is able to leverage additional investments to create the fund. However, it should not be thought that allocation of public funds to a venture capital fund will, in and of itself, solve a region's capital needs; in most cases, only a portion of the public entity's funds will be invested in the geographic region—the amount or percentage is a point of negotiation between the limited and managing partner.

Additionally, pension managers' primary responsibility is a fiduciary duty to pensioners, so securing their participation in this approach can be difficult; however, some pension systems have pursued this strategy because it diversifies the fund's portfolio and provides the opportunity to reap the higher rewards that come from earlier-stage investments.

From an economic development perspective, making a portion of pension funds available for venture capital investing has the potential not only to contribute to the availability of private equity capital in areas that lag the nation, but also can serve as a means to identify private equity investors, who otherwise would not be active in the area, to partner with the funds and become permanent sources of investment capital in the region. The pension fund's investment can provide the resources necessary for private-fund managers to start operations within a state, increasing the overall number of resident-fund managers who are knowledgeable about trends and needs in every part of the region.

Since fund managers are usually required to find additional investors, in addition to investing themselves, pension or public funds can play a catalytic role in creating a network of funds, leveraging an overall increase in the amount of funds available for investment in businesses within the region.

As with any approach, there are also potential liabilities. Private equity is at the upper end of the spectrum in investment risk, so while the asset class is capable of providing superior returns it does so with greater volatility. Thus, policymaker and pension fund beneficiaries must recognize both that there will be investment failures and that successes will be longer in coming.

There are other cautions that apply not only to pension fund investment, but to any investment of public funds through private fund managers:

Although private management has proven to be the better route for most states, not all private managers are good investors. Choosing a good investment team takes extensive research and careful judgment. A program may have strong managers but be burdened with restrictions



that make quality investing impossible. For example, severe geographical constraints, though politically popular, usually prove counterproductive. Demanding too much from even the best professionals can stretch them beyond their skills.

Failure of another kind – malfeasance – can occur when there is no oversight of fund managers, limited accountability, and nonexistent guidelines²⁷

In a review of such programs, the Rural Policy Research Institute offered a number of observations for those contemplating using public resources to leverage private equity capital investment. A summary of the report's lessons learned includes:

- Minimize the role of the state in order to avoid even the appearance of political influence with private funds. Having the state as a limited partner can affect a private fund in at least two ways. First, political influence over investment decisions may occur Second, private investors may be reluctant to invest in a fund when the state is a limited partner, particularly when there are geographic restrictions on investments as well.
- Define an explicit role for the state in monitoring the performance of private funds....
- Insure that private funds have professional venture capital managers and that the incentive structure encourages sound investments....
- Insure that fund size is consistent with fund goals and potential market size....
- Allocate resources for deal flow and entrepreneurial development. The more geographically restricted a fund, the more resources must be devoted to developing and identifying deals....
- Expect an evolution in the state's role over time. With fund success may come an opportunity to reduce the state's role in a private venture fund....²⁸

5. Tax Credits Direct to Firms

Some states use tax credits as a way of helping encourage research activity and address capital problems. The credits typically take one of two forms: a credit for R&D that companies perform or transferable tax certificates that can be sold.

In the first type of credit, companies' tax liability is reduced, and states hope that this will encourage companies to perform more R&D; it has an indirect impact on companies' capital needs by reducing the amount of cash needed to perform certain tasks. Most state credits are based on the definitions used in the federal R&D tax credit and provide a credit only for a portion of the increase in R&D spending from a base year. States with R&D tax credits should ensure that the type and number of companies using the credit and effect on the budget is tracked. A 1997 study by SSTI found that few states were able to answer those fundamental questions, which are a starting point in determining whether the credit is having the intended impact.

The second type of credit, created by New Jersey, helps address a problem with traditional R&D tax credits. Traditional R&D tax credits offer little benefit for the start-up technology companies that most areas are trying to encourage because these companies frequently will not make money in their initial years and, consequently, will not have a tax liability for the credit to reduce. New Jersey developed a program that permits companies to sell the credits they are unable to take advantage of to other companies that can use the credits to reduce their own tax bill. The result is that the company selling the credit secures needed capital to help fund their operations without having to give up any ownership. One disadvantage to this approach is that it can be fairly costly; additionally, specific guidelines may need to be established as to how frequently a company can use the program.

Example

New Jersey's Technology Business Tax Certificate Transfer Program enables eligible businesses to sell tax losses or research and development credits to raise funds to finance their growth and operations. Since 1999, new or expanding companies have been able to sell their unused net

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operating loss carryovers and R&D tax credits to corporate taxpayers within the state for at least 75 percent of the benefits. These sales allow unprofitable technology and biotech businesses to turn their losses and credits into cash to buy equipment, facilities, or other allowable expenditures. The New Jersey Economic Development Authority (NJEDA) oversees all exchanges.²⁹

Participating businesses surrender their tax benefits to the state in exchange for a certificate, which verifies their value. The proceeds from certificate sales must be used to pay for the costs of starting or expanding a technology business, including construction, salaries, R&D expenditures, and any other expenses approved by the NJEDA. Any company that has a portion of its operations in the state can purchase certificates.

Participating companies apply to the NJEDA to determine eligibility. To qualify, businesses must have fewer than 225 employees, of which 75 percent must be based in New Jersey, and have a negative net income during the past two years. Companies must also demonstrate that their activities provide the state with a competitive advantage by introducing viable new technologies to the market. The NJEDA relies on the New Jersey Commission on Science and Technology to conduct an evaluation of all applicant technologies, and the Division of Taxation to determine the monetary value of tax benefits.³⁰

The program makes \$60 million available each year for certificate transfers. Of that amount, \$10 million is specifically allotted for companies within the state's three Innovation Zones, which were established in 2004 around New Jersey's research universities. In 2005, a record 270 technology firms participated in the program.³¹

6. Debt Financing for Later Life

While most of the previous programs have focused on securing capital for younger companies, consideration must also be given as to whether there is a capital gap for more mature companies. Some areas have found that for a variety of reasons, there is a market failure in providing financing to companies to modernize their production line or product development. As a result, they have experimented in providing low-interest loans to more established technology companies.

Conclusion

Practitioners interviewed for this guide offered a variety of suggestions and advice. The advice, generally, fell into one of four areas: philosophy and approach in implementing programs, the organizational structure of programs, operational details of running these kinds of programs, and programmatic specifics. As with all of the observations and advice offered by those interviewed, these are the authors' summation of what appeared to be a consensus among those interviewed; they should not be viewed as being unanimously endorsed by all interviewed.

In the philosophy and approach in implementing programs, advice that was given included:

- Programs don't create jobs — companies do. Help create strong companies by offering holistic and individualized strategies. Create the most comprehensive, flexible portfolio of financial and technical assistance tools possible with the resources available, and do not let the mechanisms available to you drive the financing of the firm. For example, do not load up a firm with debt if that is all that can be done.
- These initiatives are much more about wealth creation than job creation; educate public officials so they will understand and accept this important distinction.
- Focus on deal quality and deal flow.
- Listen to and learn from the angels and equity partners.
- Build and sustain positive relationships, based on integrity and trust, with service providers and related economic development organizations, especially in small states where one can work with the same people frequently. Programs



aren't everything – good working relationships between the people involved can make the difference between success and failure.

- Where practical, find a strong role for the traditional lending community as a partner.
- Never stop educating legislators. With the advent of term limits in more and more states, turnover in state legislatures mandates a continuous education effort as to the need for publicly-supported investment programs and incentives.

In considering the organizational structure:

- If at all possible, provide entrepreneurship/capital programs through private, non-profit corporations. They possess the flexibility and credibility with the private sector necessary for success that government agencies generally do not.
- Be clear up front about the primary purpose of the funding mechanism: economic development or return on investment? This decision will dictate appropriate program performance metrics.
- Avoid having a political board or letting politics into the process of client/deal selection.

Specific points to consider when running these kinds of programs:

- Seek sustainable funding. The availability of private funding for entrepreneurship or capital programs from local foundations and large corporations varies widely across the country. Whether a program has access to such private funding, or instead is largely dependent on state funds (which may not be dependable from year to year) can significantly impact the scope, primary purpose, and long term impact of the program.
- Hire quality staff with the right skill sets, experience, and attitude; expect to compensate them at rates competitive in the private sector marketplace; and, anticipate turnover.
- Be prepared to protect the organization from political fallout, which may be generated by entrepreneurs that are not funded.

Finally, some points on individual program types:

- Limiting required match to investor private equity improves the chances that funded companies will perform well.
- Create smart money – identify and educate angels and prospective angels.
- Use affinities – such as alumni records, award and networking events – to identify angels.
- Angel-related tax incentives work (in states with income taxes) to increase capital availability and help develop a community of angel investors.
- Competitive grant programs help to create community and ultimately foster higher quality business deals.
- Select fund managers with local or regional ties and understanding.
- Conduct *continuous*, aggressive outreach and communications efforts to identify and mobilize both entrepreneurs and investors. While both approaches are necessary, the message is more effectively conveyed on a retail rather than wholesale basis. Entrepreneurs in particular will only pay attention to the message at the point that they need the services provided.

¹PricewaterhouseCoopers/National Venture Capital Association *MoneyTree™* Report; available from <http://www.pwcmoneytree.com/displays/notice-B.html>; accessed 30 August 2006.

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³Center for Venture Research, *Q1Q2 2005 Angel Market Analysis Report* [on-line]; available from http://wsbe.unh.edu/Centers_CVR/Q1Q22005analysisreport.cfm; accessed 30 August 2006.

⁴Susan L. Preston, *Angel Investment Groups, Networks, and Funds: A Guidebook to Developing the Right Angel Organization for Your Community*, (Ewing Marion Kauffman Foundation: August 2004 edition), p 3.

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- ²⁷ Heard and Sibert, p. 14.
- ²⁸ David L. Barkley, Deborah M. Markley, and Julia Sass Rubin, Julia Sass, *Public Involvement in Venture Capital Funds: Lessons from Three Program Alternatives* (Rural Policy Research Institute, RUPRI Rural
- ²⁹ Equity Capital Panel, November, 1999, Updated February 2000), p99-9. Technology Centre of New Jersey; "Technology Business Tax Certificate Transfer Program;" ; http://www.njtechcentre.com/pr_060506; accessed 30 August 2006.
- ³⁰ New Jersey Economic Development Authority; "New Jersey Economic Development Authority Technology Business Tax Certificate Transfer Program – March 2006;" <http://www.njeda.com/applications.asp#taxcertificate>; accessed 30 August 2006.
- ³¹ New Jersey Economic Development Authority, "Bolstering New Jersey's Technology-Driven Economy an EDA Priority, Authority CEO Tells NJTC Conference Attendees;" http://www.njeda.com/pr_012706.asp; accessed 30 August 2006.

COMMERCIALIZATION ACTIVITIES ROADMAP

STAGE I
Investigation

The innovator has a new product or technology advancement with seemingly positive market potential. However, the innovator has the combination of limited financial resources and business expertise to commercialize the product.

STAGE II
Feasibility

At this stage the company's management team is incomplete with no product revenues. The final design of the product is complete and an initial business plan is developed.

STAGE III
Development

At this stage, the company continues to develop the product prototype with the goal of completion. Significant expenses are incurred at this stage with no product related revenues. This stage is usually at the deepest point in the "valley of the death".

STAGE IV
Introduction

At this stage, the company has limited product revenue and the product is being introduced into the market.

STAGE V
Growth

At this stage the company is in full production with the main product and expanding distribution. The management is in transition to a formal organizational structure.

STAGE VI
Maturity

The company is now well established in the market place and must continually innovate to stay competitive.

RISK PROFILE

PRODUCT ASSESSMENT

- Define concept
- Confirm critical assumptions
- Survey state of the art
- Identify critical barriers
- Evaluate applicability
- Determine technology

PRODUCT FEASIBILITY

- Develop working model
- Test technical features
- Assess preliminary producibility
- Conduct mtg. assessment
- Assess safety & environmental features
- Finalize designs

PRODUCT PROTOTYPE

- Develop prototype
- Identify materials and processes
- Conduct tests
- Implement development methods

PRE-PRODUCTION PROTOTYPE

- Develop production prototype
- Determine production process
- Select equipment
- Design field support system
- Demo product features

PRODUCTION

- Prepare commercial design
- Establish quality control
- Construct facilities
- Conduct full production
- Finalize internal distribution system

PRODUCTION SUPPORT

- Maximize production
- Establish after market support, repairs and spares
- Warrantee service
- Implement training program

MARKET

MARKET NEEDS ASSESSMENT

Conduct market overview & identify:

- Pricing structure
- Market barriers
- Risks
- Distribution channels
- Trends and competitors

MARKET STUDY

Identify and quantify:

- Market size
- Customers
- Volume
- Prices
- Distribution
- Competitors

MARKET PLAN

- Identify marketing team
- Define target market
- Select market channels
- Field test

MARKET VALIDATION

- Establish market relationships
- Conduct limited sales
- Analyze sales
- Survey customers
- Refine marketing plan

SALES AND DISTRIBUTION

- Expand distribution
- Analyze competitor response
- Assess customer satisfaction
- Assess distributor satisfaction
- Refine product features

MARKET DIVERSIFICATION

- Develop market retention
- Establish market scan
- Identify new markets
- Identify new products

BUSINESS

BUSINESS ASSESSMENT

- Estimate profit potential
- Conduct self, enterprise and commercialization assessments
- Identify professional needs
- Identify capital needs

ECONOMIC FEASIBILITY

- Formulate financial assumptions
- Develop pro forma
- Identify seed capital
- Form advisory team

STRATEGIC BUSINESS PLAN

- Decide venture or license
- Finalize intellectual property
- Identify management team
- Select organization structure
- Write business plan

BUSINESS START-UP

- Establish business function
- Hire staff
- Execute contracts
- Secure first-stage financing

BUSINESS GROWTH

- Monitor enterprise position
- Hire and train personnel
- Execute contracts
- Arrange financing
- Institute vision, mission and management policies

BUSINESS MATURITY

- Establish SWOT process
- Invest profits
- Monitor product life cycle
- Monitor business trends
- Monitor mgmt. technologies
- Implement innovations

Appendix B

Definition of Terms

In order to provide a grassroots perspective of publicly-funded capital programs, this report draws heavily on interviews with experienced practitioners from around the country. The advantage of this approach is that it provides a first-hand perspective of what is being done, what works and what does not. The disadvantage is that practitioners sometimes use the same terminology to mean different things. The following are offered as general “rule-of-thumb” definitions for some of the terms used in this report.

Angel group A group of angel investors investing through a member-directed investment process. One of the primary criteria for membership is net worth or accredited investor status of the group members. Another constant and part of the definition that separates angel groups from other investment vehicles is the active participation of angel group members in the investment of their own capital. In contrast, venture capital funds, broker dealers and investment bankers typically operate on a passive investor model — the individual is not actively involved in the investment decision-making process. (*A Guidebook to Developing the Right Angel Organization for Your Community, August, 2004 Edition, Ewing Marion Kauffman Foundation*)

Angel investor An individual who provides capital to one or more startup companies. The individual is usually affluent or has a personal stake in the success of the venture. Such investments are characterized by high levels of risk and a potentially large return on investment. According to the SEC “Regulation D,” an accredited Angel Investor is a person with a net worth of \$1,000,000, or an annual net income of \$200,000 for the past three years. (*investorwords.com*)

Contingent liability A potential obligation that may be incurred dependent upon the occurrence of a future event. (*allbusiness.com/glossary*)

Convertible debenture Debenture that can be converted into stock at the option of the holder and/or the issuer at a specified date in the future. Because the buyer has the ability to convert the debenture into stock under certain circumstances, the seller is able to borrow at a lower cost than if the convertibility feature was not present. Deal flow The rate at which investment offers are presented to funding institutions. (*investorwords.com*)

Due diligence The process of investigation, performed by investors, into the details of a potential investment, such as an examination of operations and management and the verification of material facts. (*investorwords.com*)

Early- or first-stage financing is provided to companies that have expended their initial capital (often in developing and market testing a prototype) and require funds to initiate full-scale manufacturing and sales. (*Pratt’s*)

Equity Ownership interest in a corporation in the form of common stock or preferred stock. It also refers to total assets minus total liabilities, in which case it is also referred to as shareholder’s equity or net worth or book value. (*investorwords.com*)

Expansion financing is second and subsequent investment rounds typically financing company product and/or market expansion, or keeping the company financially healthy shortly before a liquidity event such as an initial public offering (IPO) or acquisition. (*Pratt’s*)

Fund-of-funds or Fund-to-funds Some states use tax credits as guarantees to generate a “fund-to-funds” for investments in private venture capital funds in order to incentivize those funds to create a local presence and invest in local deals. Investments are made in several private partnerships, along with other investors. The strategy is to select partnerships that are expected to produce excellent market returns while contributing to the growth of a healthy, local venture capital industry. (*Heard and Sibert*)

Proof-of-concept Evidence that demonstrates that a business model or idea is feasible. (*investorwords.com*)



Seed financing is a relatively small amount of capital provided to an inventor or entrepreneur to prove a concept and to qualify for start-up capital. This may involve product development and market research, as well as building a management team and developing a business plan, if the initial steps are successful. (By this definition, pre-seed financing would denote financing to help articulate the concept.) (*Pratt's Guidebook to Venture Capital Sources; 2001 Edition*)

Seed funds Seed funds are professionally managed investment partnerships, or limited liability companies (LLCs), that invest in very young, seed-stage companies. Seed capital has always been considered a part of venture capital, specifically directed to early-stage ventures. (*Heard and Sibert*)

Start-up financing is provided to companies completing product development and initial marketing. Companies may be in the process of organizing, or they may already be in business for one year or less, but have not sold their product commercially. Usually such firms will have made market studies, assembled the key management, developed a business plan and are ready to do business. (*Pratt's*)

Venture capital Long-term equity capital invested in rapidly expanding enterprises with an expectation of significant capital gains, often for product roll-out. Typical investee companies have demonstrated sales but are not yet profitable. (*Heard & Sibert*)

Venture capital firm An investment company that invests its shareholders' money in startups and other risky but potentially very profitable ventures. (*investorwords.com*)



Appendix C

Practitioners Interviewed

Almost 60 tech-based economic development practitioners were interviewed for this guide. They were selected based on their experience and knowledge. SSTI is deeply grateful for their participation in the project. Each of the practitioners was generous with their time and their willingness to support the TBED community as a whole by participating. The list below provides the title and organization for the participants at the time they were interviewed.

David N. Allen

Assistant Vice President, Technology Transfer
University of Colorado/Boulder

Richard Bendis

President & CEO
Innovation Philadelphia

Russell W. Bessette

Executive Director
NYSTAR

Jay Brandinger

Executive Director (retired)
New Jersey Commission on Science and Technology

Bill Brundage

Commissioner
Office of the New Economy

Chris Busch

Michael Cassidy

President
Georgia Research Alliance

Norman Chagnon

Staff Director
Third Frontier Commission
Ohio Department of Development

Lee Cheatham

Executive Director
Washington Technology Center

Lori Clark

Senior Policy Advisor
Illinois Department of Commerce & Economic Opportunity

Claire Collins

Partner
Lovett Collins Associates, LLC

Robert W. Coy, Jr.

Senior VP, Economic Development
St. Louis Regional Chamber of Commerce

Robert Crowley

President
Massachusetts Technology Development Corp.

Jim Currie

Program Director
Ohio State University – ATECH

Brian Darmody

Assistant Vice President for Research and Economic Development
University of Maryland College Park

David L. Day

Director of Research Programs
University of Florida

Dave Desch

Executive Director
Montana Board of Research and Commercialization Technology

David Driver

Managing Director Regional Development
Northeast Utilities System

David Eater

Assistant Director (former)
New Jersey Commission on Science and Technology

Joseph Fink

Vice President, Research and Economic Development
University of Kentucky

Michael Finney

President & CEO
Greater Rochester Enterprise

Ted Ford

President & CEO
EWI

Stephen J. Gage

President
CAMP, Inc.

Bruce Gjovig

Director, Center for Innovation
University of North Dakota

Randy Goldsmith

Assistant VP of Technology Transfer and Economic Development
University of Texas at San Antonio



Norma E. Grace

Vice Chancellor
University of New Orleans

Robert G. Heard

President
Edge Development Capital

Philip Helgerson

Director (former)
Applied Technology Development Center

Dennis Herringshaw

Director, Office of Technology Transfer
University of New Orleans

Wayne Hodges

Vice Provost for Economic Development
and Tech Ventures
Georgia Institute of Technology

H. Graham Jones

Associate
Hudson Group

Jacques Koppel

President
Koppel Group

Leslie Lane

Vice President
Finance
Arkansas Science and Technology
Authority

Stan Liberty

Provost
Bradley University

Rod Linton

Director, Office of Technology and
Science
Utah Department of Community and
Economic Development

Greg Main

President & CEO
i2E

Marcia Mellitz

President
Center for Emerging Technologies

Cliff Numark

President
CustomerIntellect

Timothy J. O'Brien

Director, Biomedical Biotechnology
Center
University of Arkansas Medical Services

Tom Rogers

President & CEO
Technology 2020

RoseAnn Rosenthal

President & CEO
Ben Franklin Technology Partners of
Southeastern PA

Carl E. Russell

Vice President
Board Director and Project Coordinator,
BIO-SA

V. F. Russo

President & CEO
Ben Franklin Technology Partners of
Central & Northern PA

Ron Sampson

President
National Institute for Strategic
Technology Acquisition and
Commercialization (NISTAC)

Rohit Shukla

C.E.O.
LARTA

John Sibert

Managing Director
Global Financial Group

Phillip Singerman

Venture Partner
Toucan Capital Corp

Donald F. Smith

Vice President for Economic
Development
MPC Corporation
Carnegie Mellon University

Patricia Snider

President & CEO
BioGenerator

Philip Z. Sobocinski

Assistant Director
University of Wisconsin-Madison

Janice St. Onge

Director of Business Education
University of Vermont

Thomas Thornton

President
Illinois Technology Development Alliance

Theresa Walker

Technology Transfer Officer
SUNY Albany

Appendix C

Tom Walker

Executive Vice President & COO
i2E

Jake Ward

Executive Director
Office of Research and Economic
Development, University of Maine at
Orono

Tab Wilkins

Director, Regional & Technical Services
Washington Technology Center

Mike Wojcicki

Director of Investor and Partner Relations
Wisconsin Manufacturing Extension
Partnership

Janet Yancey-Wrona

Director, Office of Innovation
Maine Department of Economic and
Community Development

