TECHNOLOGY-BASED ECONOMIC DEVELOPMENT: CONNECTING THE RESEARCH UNIVERSITY AND COMMUNITY LEADERS

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**Executive Summary.** The roles of research universities in contemporary society are changing. While still focused primarily on teaching, research and service, increasingly research universities are being expected to leverage their research activities for economic development purposes. But are university leaders and the economic development professionals in communities where these institutions are located truly cooperating to grow technology-based firms?

This case study has two thrusts. First it describes an initiative in the upper Midwest – The Coalition for University Regional Economies (CURE) – to bring together leaders from research universities with their community economic development counterparts to enhance cooperation and share ideas about fostering university-community collaborations. It grew to include representatives from seventeen communities and sixteen universities. Second, the case study describes in detail one initiative of the group, an effort to compile possible outcome measures for university activities relevant to economic development from the joint perspectives of the university and the community.

**Introduction**

Over the past two decades, universities have become increasingly more engaged in regional economic development (Noftsginer 2002). At the same time, institutions are seeking alternative sources of revenue to help meet ever-escalating costs and, in the case of public institutions, continually shrinking percentages of funding from state and federal sources. Increases in university spin-off and incubation activities, for example, have been spurred by universities’ need to increase research revenue in the wake of the post-Cold War decline in long-term research funding.

The changing social and economic landscape has shaped a new university-industry dynamic, one that is founded on

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ED needs and objectives. Knowledge has become a critical asset and has become increasingly important for achieving competitive advantage. This has pushed firms (and those seeking to develop a strong economy based on these firms) toward the university as a source of knowledge. Economic pressures have caused a reciprocal reaction by universities, as they look to industry for resources and financial support (Santoro and Betts 2002). As such, both the number and complexity of community-university partnerships increased over the past two decades (Noftsinger 2002).

There is a new social contract between the university and the community because “new scientific knowledge is intrinsically useful, a reservoir of knowledge that can be applied to national needs” (Sobol and Newell 2003, 256). The higher education arena has seen a new model of the “entrepreneurial university” that directly results from the reshaping of the university’s traditional missions of research, teaching, and serving in response to new social and economic challenges. According to Noftsinger (2002, 22) this new model is “more directly involved in the commercialization of research and embraces technology in all aspects of teaching, research and service.”

However, “unlike the private sector, where success is measured by profits, university goals are more diverse. In addition to generating royalties and sponsored research, universities (in particular, public universities) are expected to contribute to economic development” (Thursby, et al. 2001, 59). The shift in university roles and expectations has refocused attention on the dichotomy facing institutions of higher education that are active in technology transfer and commercialization activities: should the emphasis be on the revenue produced or on “getting the technology out there to be used?” Some would argue that income maximization should be the goal in tight budgetary times for the institutions that show no possibility of reverting to former levels of financial support from public sources, while others would argue for being faithful to traditional academic, nonprofit tenets of serving the public good by getting technological advances out for adoption as quickly as possible.

The importance of the institutional mission statement and unit mission statements in answering these questions and directing institutional priorities should not be overlooked. One major strength of the over three thousand universities and colleges in the U.S. is the diversity represented in the group. Some choose to place primary emphasis on teaching or feature an exclusive emphasis on undergraduate instruction. Others exalt graduate education and the attendant research that accompanies it.

This case study discusses the Coalition for University Regional Economies (CURE) as an organization that serves to link universities with their communities to foster ED that benefits both parties. The case study also reports on goal and outcome metrics for technology transfer, commercialization, and research park development from the joint perspectives of the university and the community. It summarizes a process, undertaken in 2004 by CURE, for identifying those goals and outcome metrics for university technology-based ED activities that are relevant from both the university and
community perspectives. The process was an attempt at not only reconciling the dual university objectives of revenue generation and technology availability, but also incorporating the views of those ED practitioners who must work with the university in facilitating revenue generation and the transfer or application of university research.

The Coalition for University Regional Economies (CURE)
The Coalition for University Regional Economies (CURE) was created in 2001 as a byproduct of the Bloomington (Indiana) Economic Development Corporation’s efforts to update its strategic plan. As part of this update process, President Linda Williamson invited a group of university officials and ED leaders from a number of university cities in the Midwest to a one-day meeting to discuss how ED leaders used the presence of a research university for ED purposes and how the university officials viewed their potential for contributing in this area. One person from the higher education institution and one from the local ED organization were invited from each community. It is interesting to note in passing that a number of universities reported encountering a challenge when asked to identify the appropriate institutional official to attend.

The organization’s formative meeting was held on December 11, 2001 in Chicago. A second meeting was held in West Lafayette, Indiana, in late June 2002. This meeting saw an increase in attendance with several additional communities and universities sending their representatives. During this second session the CURE group decided that it would continue to meet twice annually, with a fall/winter session in Chicago and a spring/summer session on one of the university campuses.

The sixth CURE meeting was in Iowa City, Iowa on July 20-21, 2004. It was at this 2004 gathering that a session was devoted to a discussion of goals and outcome measures for technology transfer, commercialization, and research park development: backbone activities for university-based ED. The next section discusses this session and the process undertaken to identify goals and outcomes measures that are relevant from both the university and ED perspectives.

Table 1 lists the universities and communities that participated in CURE. One interesting note with regard to this table is that several strong research universities (e.g., University of Michigan, University of Wisconsin) did not participate in CURE, although their communities were represented.

Measuring technology-based ED from the joint university-community perspective
During the 2004 spring/summer session in Iowa City, CURE hosted a session devoted to discussing university activities related to technology-based ED. The purpose was to arrive at goals and outcome measures that were relevant from the joint perspectives of the university and the community. It was the goal of this session, which lasted slightly over one hour, to stimulate discussion on the topic and focus consideration of the issues by representatives of both universities and ED agencies. An almost equal number of university and ED representatives participated in the discussion.
Table 1. Institutions and communities with representatives attending CURE meetings between December 2001 and July 2004

<table>
<thead>
<tr>
<th>COMMUNITY</th>
<th>UNIVERSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ames, IA</td>
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<tr>
<td>Ann Arbor, MI</td>
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<tr>
<td>Athens, OH</td>
<td>Ohio University</td>
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<tr>
<td>Bloomington, IL</td>
<td>Illinois State University</td>
</tr>
<tr>
<td>Bloomington, IN</td>
<td>Indiana University</td>
</tr>
<tr>
<td>Champaign, IL</td>
<td>University of Illinois</td>
</tr>
<tr>
<td>Columbia, MO</td>
<td>University of Missouri</td>
</tr>
<tr>
<td>Indianapolis, IN</td>
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</tr>
<tr>
<td>Iowa City, IA</td>
<td>University of Iowa</td>
</tr>
<tr>
<td>Lafayette, IN</td>
<td>Purdue University</td>
</tr>
<tr>
<td>Lawrence, KS</td>
<td>University of Kansas</td>
</tr>
<tr>
<td>Lexington, KY</td>
<td>University of Kentucky</td>
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<tr>
<td>Madison, WI</td>
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<tr>
<td>Manhattan, KS</td>
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<tr>
<td>Norman, OK</td>
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<tr>
<td>South Bend, IN</td>
<td>University of Notre Dame</td>
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<tr>
<td>Washtenaw County, MI</td>
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</tr>
<tr>
<td></td>
<td>Heartland Community College</td>
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<tr>
<td></td>
<td>Kirkwood Community College</td>
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<tr>
<td></td>
<td>Pennsylvania State University</td>
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<td></td>
<td>University of Arkansas</td>
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<tr>
<td></td>
<td>University of Iowa</td>
</tr>
<tr>
<td></td>
<td>University of Northern Iowa</td>
</tr>
</tbody>
</table>

One university representative (Joseph Fink) was invited to lead the discussion by compiling an initial list of possible goals and metrics or outcomes measures from the viewpoint of a university. This list was intended as the starting point to stimulate discussion and focus consideration of the issues by representatives of both universities and ED agencies at the meeting.

The initial list of goals and outcome metrics for use in the discussion of the evolving areas of university activity was prepared with the dual objectives of focusing conversation and stimulating give-and-take among the participants. These goals were divided along the lines of the three major categories of university ED activities – technology transfer, commercialization, and research park development – as summarized in Table 2.
Table 2. Initial list of goals

<table>
<thead>
<tr>
<th>Technology Transfer</th>
<th>Commercialization</th>
<th>Research Park Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Get the innovations out there to be used</td>
<td>▪ Create spin out companies</td>
<td>▪ Engender employment growth for the community</td>
</tr>
<tr>
<td>▪ Generate funding for the institution</td>
<td>▪ Attract and retain faculty and staff</td>
<td>▪ Stimulate revenue growth for the institution</td>
</tr>
<tr>
<td>▪ Attract and retain faculty and staff</td>
<td>▪ Inspire by example students and alumni</td>
<td>▪ Decompress demand for campus space</td>
</tr>
</tbody>
</table>

Goals and outcome measures from the university’s perspective

The list of outcome measures for use in these areas was compiled with a dual mandate: (1) list those that should be used, and (2) include some that the participants would hopefully agree should be avoided. These outcome measures are presented in Table 3. Again, they were categorized into the three categories of university ED activity.

Table 3. Initial list of outcome measures

<table>
<thead>
<tr>
<th>Technology Transfer</th>
<th>Commercialization</th>
<th>Research Park Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Number of IP disclosures</td>
<td>▪ Number of companies formed</td>
<td>▪ Number of alumni employed</td>
</tr>
<tr>
<td>▪ Percentage of IPs being pursued</td>
<td>▪ Number of jobs created</td>
<td>▪ Number of student placements</td>
</tr>
<tr>
<td>▪ Number of patent applications filed – provisional versus utility</td>
<td>▪ Amount of financing secured by start-up firms</td>
<td>▪ Number of collaborative agreements</td>
</tr>
<tr>
<td>▪ Number of patents issued per year</td>
<td>▪ Number of SBIR/STTR grants applied for and awarded</td>
<td>▪ Number of university units in the park</td>
</tr>
<tr>
<td>▪ Number of patents in the overall portfolio</td>
<td>▪ Survival rates of firms at three year and five year anniversaries</td>
<td>▪ Number of firms in the park</td>
</tr>
<tr>
<td>▪ Number of activities to “weed out” the inventory</td>
<td>▪ Amount of tax revenue generated</td>
<td>▪ Number of jobs created</td>
</tr>
<tr>
<td>▪ Number of copyright cases handled</td>
<td>▪ Number of SBIR/STTR grants to start-ups in the state</td>
<td>▪ Average salary of those jobs</td>
</tr>
<tr>
<td>▪ Amount of IP royalty income</td>
<td></td>
<td>▪ Value of real estate in the park</td>
</tr>
<tr>
<td>▪ Amount of IP expenses</td>
<td></td>
<td>▪ Number of unique facilities in the park</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Number of research-related facilities in the park</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Number of manufacturing facilities in the park</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Amount of tax revenue generated</td>
</tr>
</tbody>
</table>
The discussion
When the roundtable session was launched it did not take long for the participants to get enthusiastic with their give-and-take discussion and critique of the lists that had been prepared as a point of departure. Introductory comments at the session indicated that the university and ED representatives would be asked to do several things:
1) Add to and refine both lists;
2) Develop measures for each goal;
3) Determine whether a comparative benchmarking instrument could be developed from this process; and
4) Create a list that could be used by ED groups when working with universities.

During the discussion, however, “Goals” and “Outcomes” were changed to “Inputs” and “Outputs” and lost the categorization of the three areas of activity – technology transfer, commercialization, and research park development. The discussion also shifted the focus away from emphasizing goals and their consequential outcomes to instead identifying the inputs necessary for university ED activities to occur and the subsequent outputs of the university process by which these activities are undertaken.

Inputs and outputs for university technology-based ED
Tables 4 through 10 present the final list of inputs identified during the CURE discussion. Table 11 presents the final list of outputs agreed on by participants in the roundtable session. During the discussion, CURE members also brought up two additional categories of ED activities – entrepreneurship and educational/workforce issues – that they believed universities were also capable of contributing. This suggests that participants believed that the university’s role in ED is not limited only to the research/discovery, technology transfer, and commercialization. The final list also suggests that the university’s involvement in ED requires whole-hearted commitment, both from an institutional perspective via policies and executive practices, and through the commitment of university personnel and resources.

Table 4. University policy and practice
1) ED role is included in university strategy/mission statement
2) Trustees support ED involvement
3) ED is mentioned prominently in President’s/Chancellor’s speeches
4) Coordinated, comprehensive media relations plan exists in ED areas
5) Grassroots political action plan for ED is in place
6) ED role is recognized by governor, key legislators
7) Joint University/Local Economic Development Organization (U/LEDO) state legislative positions (partnerships/chamber memberships)
8) Joint U/LEDO stance on relevant federal issues
9) Deans and Directors of Centers/Institutes discuss ED topics University communicates an ED message to appropriate audiences (chamber/ legislature/business groups)
10) Communications across/between state institutions of all types –
Universities/Land Grant/Regent Institutions/Community Colleges
11) Coordinated umbrella organization of a group requesting funding/staff tim
12) Review reporting requirements for ED functions in the university setting
13) Incorporate university legislative priorities into chamber legislative
    priorities
14) Engage university development office with corporate opportunities for ED
15) Clarify university policies on access to specialized equipment
    (charges/forms/ agreements)

Table 5. Technology transfer and discovery
1) Level of sponsored research in key areas of the institution
2) Level of industry-sponsored research in key areas
3) Number of SBIR/STTR grants
4) Number of invention disclosures
5) Level of patenting activity – applications/year, number issued/year and
    amount of IP expenses and royalty income
6) Size of total patent portfolio
7) Number of license agreements (excluding logo, apparel, etc.)
8) Amount of license income (excluding logo, apparel, etc.)
9) Support for business incubation – wet lab vs. office/generic space –
    ancillary support services
10) University royalty/overhead policies
11) ED/commercialization activities count toward tenure
12) Number of research centers and institutes
13) Support for introducing innovations for application and use
14) Funds generated from these activities
15) Attracting and retaining faculty and staff
16) Percentage of IP disclosures pursued for protection – patent and copyright

Table 6. Entrepreneurship
1) Number of students enrolled in undergraduate entrepreneurship programs
2) Number of students enrolled in graduate entrepreneurship programs
3) Support for Small Business Development Centers
4) Special resources for high-growth entrepreneurial companies
5) Ancillary entrepreneurship services available from the university
6) Entrepreneurial workshops and seminars
7) Coordinated cross-college extracurricular activities
8) Participation in business plan or business idea competitions
9) Availability of faculty training in entrepreneurship
10) Entrepreneurial leave policy for faculty or staff
11) Policies to identify and manage faculty or staff conflict of interest
12) Entrepreneurs in residence
13) Support systems for information technology/communications technology
14) Local university cable channel (e.g., Research Channel)
Table 7. Business assistance / research parks
1) Business incubation support for university-related companies
2) Business incubation support for non-university-related companies
3) Support of seed capital and/or angel funding – local/regional/ state
4) Investment in local venture capital
5) Monthly IT networking meeting
6) Development of university-related technology park
7) Marketing/promotion budget for research park
8) Direct involvement in business attraction and hosting
9) Willingness to sign and nature of basic agreements with new area companies

Table 8. Education / workforce issues
1) Joint degree programs of business with other colleges
2) Number of undergraduate, graduate, and professional students in key areas – defined both generally and by cluster
3) ED organization has joint planning and articulation agreements with local community college/technical schools
4) Support of K-12 interest groups
5) Participation in and knowledge of regional workforce development strategy
6) Participation in identification of under-employed graduates or significant others
7) Participation in regional job net system
8) Participation in spousal placement network
9) On-job training/internships
10) Career exploration opportunities in K-12
11) Connecting school counselors to area businesses
12) Creating credits for students who do career exploration

Table 9. Commercialization
1) Number of spin-out companies from the university
2) Impact on attracting and retaining faculty and staff
3) Staffing for functions related to licensing and incubation space
4) Number of companies formed and number of jobs created
5) Number of SBIR/STTR grants applied for and awarded
6) Three and five year survival rates of firms
7) Role of institution in creating investment capital

Table 10. Other categories or issues
Tax base issues
1) Payment in lieu of taxes (PILOT) to city for basic services
2) Willingness to sell off tax-exempt endowment commercial and rental real estate
3) Support of neighborhood planning
4) Support of downtown development
5) Willingness to put non-educational enterprises on tax rolls
Other
1) Quality of life – related to human capital
2) Industrial Affiliate Programs – advisory boards for the university

Other university resources
1) Willingness to develop new academic/research programs for major new business development
2) Inventory of faculty with business contact resources
3) Mining for intellectual property – survey faculty and staff to identify possible opportunities
4) Policies that require nondisclosure agreements when researchers are discussing their research in detail with commercial representatives

The roundtable’s discussion also resulted in a list of expected outputs of university ED activities. These outputs represent the consensus reached by both university and ED participants on what should constitute the measurable output of the university’s involvement in local ED. These outputs can also be viewed as the desired contributions of the university to local economic growth.

Table 11. List of outputs
1) Job creation tied to research dollar impact
2) Average salary of jobs created, not just head count
3) Tax base development
4) University economic impact – jobs, taxes, etc.
5) Total economic impact of jobs created
6) Jobs on campus funded without state dollars
7) University should include such information in its annual report
8) University knowledge base moves cutting-edge technologies forward
9) Intangible asset: University’s accomplishments create pride in the state

Conclusion
The goal of the process described in this case study was to create a list of goals and outcome metrics that could be considered for use by both university and ED officials when considering or engaging in technology-based ED activities. The end product, however, was a list of inputs for and outputs of university ED activities. The results of the process demonstrate that beyond research, technology transfer and commercialization, university ED activities extend to include education, workforce and entrepreneurship issues. University policy and practices, in addition to university resources, were identified as necessary inputs in support of the university’s ED pursuits. The CURE discussion, and the subsequent list of inputs and outputs, provided the opportunity to better understand technology-based activities in a way that bridges the university’s perspective and that of the local community as represented by ED practitioners.

So, where do university and community leaders go from here? While the process did not produce the desired outcomes – namely the goals and outcome metrics of
university ED – it did produce a list of inputs and outputs that are considered relevant from both the university and community perspectives. This, at least, is the first step in the process of defining how universities and ED organizations should measure the outcomes of the university’s engagement in regional development, especially technology-based ED. Effective evaluation of the university’s performance requires knowing what goes in, as well as what comes out. But the output is not enough. We need to have goals so that the output can be translated into outcomes. Those outcomes need to be measurable, and must not be easily skewed or misinterpreted.

For example, it is one thing to agree that one of the outputs of university research, technology transfer and commercialization should be that the university’s accomplishments create pride in the state. It is another to translate this output into a quantifiable outcome metric. On the other hand, moving cutting-edge technologies forward could be easily translated into the number of patents or related patenting activity as the outcome metric. Yet, this outcome metric can be misinterpreted, to the extent that universities engage in unproductive activities such as ‘patenting for the sake of patenting’ (Langford, Hall, Josty, Matos, and Jacobson 2005).

The next step in the process, therefore, would be to move from inputs and outputs to outcomes. In doing so, several issues will require attention, including, for example (1) the time lag between inputs and output; (2) measurability of the outcome; (3) possible misinterpretation of the outcome metric; and (4) standardization of outcome measures across different universities. In addition, we need to heed Scott and Audretsch’s (2003) advice that we no longer focus on those revenue and visibility metrics that represent the low-hanging fruit of the metrics tree. The same process we describe in this case study could easily be adapted to address these issues.

References and further reading


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