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ECONOMIC DEVELOPMENT AT A PUBLIC UNIVERSITY – A PROCESS MODEL AND ASSOCIATED METRICS

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ABSTRACT

A university has long been considered an institution of higher learning with the immutable dual goals of research and teaching. A “public” university, however, has also had the founding principle of service, the performance of which is often linked to the region from which it receives public funds. Recently, this service component has morphed to playing an active role in regional economic development. This paper reviews the factors that have led to the situation in which a public university must define a relevant and significant set of objectives for itself in improving the economy of the community it serves. Further, a process model is suggested along with associated metrics, based on practices followed at several universities each of which has played a major role in regional economic development.

Keywords: *Regional Economic Development; Public University Community Service; Wealth Creation; Net Job Creation.*

1. ECONOMIC DEVELOPMENT AND THE PUBLIC UNIVERSITY

Public universities are being asked to define their relevance to the creation of economic wealth for the region’s citizenry and the efficiency of how they use taxpayer dollars for that purpose. (Arbo, 2003; King, 2000) For example, would be matriculants now ask specifics about the education they will receive at a public university and how it relates to better paying jobs. After all, going to college is an investment of money and more importantly - time. In the past, a public university simply supplied education in various curricula without having to justify a “return on investment” or its relevance to regional needs. The phrase “economic development” is associated with the improvement of a region’s economy the manifestation of which is often debated. Indeed, the collective economic wealth of a region is not easy to measure. For example, creation of jobs, although on the surface such activity may be welcomed if high unemployment exists in the region, does not necessarily increase the collective wealth of a region since the new jobs could be simply substitutes for existing ones. Similarly, the activities that would raise the average wage of the region’s employable workers are often associated with economic development. However, if inflation accompanies such a wage increase then the worker may be no better off, The point of these examples is that the use of simplistic metrics for economic development may be misleading. The observance of additional economic factors, constituting a holistic approach to measuring a region’s economic progress, is necessary to determine whether economic development measures in a region are achieving results.

The wealth of a region (or a nation) has depended on the competitive use of resources to deliver goods and services to other regions. If a region has few or no resources, natural or human, prepared to compete with those of other regions, economic wealth is difficult to create if the region is not self-reliant. This simple concept has led to acceptance of the need for regions to “export” goods and services in order to satisfy the needs of its citizens that require goods and services that cannot be competitively delivered in the region and must be imported from other regions. In addition, a region’s population growth rate dictates that jobs must be created at or above the rate at which its youth is entering the workforce. These newly created jobs must be at a spectrum of wage levels that increases the region’s per capita earnings relative to the rest of the country. For example, at the extreme, suppose all new jobs were at the minimum wage level. This situation would induce many of the brightest of the region’s youth, and possibly the best educated, to leave the region to find higher paying jobs elsewhere. What are the resources of a region that can help in this economic equation? The public university has always been seen as a regional resource, mainly as a supplier of educational services, a storehouse of knowledge and a fount of innovation to the regional population. In education, the university contributes to wealth creation by having its graduates initiate and grow business opportunities that lead to higher levels of exports and higher per capita income for the residents of the region.

There are many cases in which public universities have played a major role in regional economic development – UC at San Diego, North Carolina State, University of Maryland, Georgia Institute of Technology and many others. These examples serve to point out the diversity of the regions as was the methodology used to mobilize the resources at the university in revitalizing and growing of the economy of the region each individually serves. In these cases the public recognized the decline of the region's traditional industry – tobacco and cotton in Georgia and North Carolina, textiles and machinery in Massachusetts and later in North Carolina, government installations in southern California – and then invested in university resources to revitalize the region's economy with knowledge industries, namely, high technology, software and computer networking, financial and insurance services, etc. In these specific cases the university played a major role and its value as a service provisioning institution was recognized.

In the US, beginning with Bayh-Dole Act of 1980, awareness has mounted of the university as a source of intellectual property to be mined by the region's industrial and commercial base. But there are other contributions that a public university can make towards a region's wealth and job creation. Namely, the public university can be a:

- large business enterprise,
- formulator of public policy,
- developer of the regional workforce,
- originator of technology and its transfer agent,
- spawning ground for entrepreneurs,
- supporter of small business.

By recognizing the importance of each of these roles we will suggest a process and associated metrics by which a public university can transition to a more active level in the area of economic development. Once the university embarks on such a process it will find that it require changes in course offerings, faculty reward systems, pedagogy, and public university infrastructure. (Klein & Associates, 1998)

2. THE UNIVERSITY AS AN ENTERPRISE

A university is often a large regional employer as well and can be an economic force in a region in terms of jobs and purchaser of materials and services. Certainly administrators, faculty members and researchers take up high paying positions. However, these positions form only a fraction of the total number of jobs at a public university, the remainder consisting of staff and support positions that often are at an average or below average regional wage level. Since labor costs form about three quarters of the public university budget, how the university engages its workforce and trains it is important for the region. Some universities have a policy to not hire its own graduates for faculty membership, principally because it encourages cross fertilization of research ideas with other universities and teaching methods that are best developed with input from other institutions as well. Hence, unless a regional resident is the graduate of an out-of-region university, a high paying faculty position does not normally go to a regional resident. For similar reasons, research positions also are rarely awarded to those who hail from the region. It is in the staff and support positions that regional residents have the best opportunity to find jobs.

Unfortunately, as noted earlier, many of these positions, at best, pay average wages. Hence, the per capita income of regional residents does not go up due to their assuming high paying jobs at a public university.

On the purchasing side, many public universities are obligated to put out for bid its large procurements of materials, supplies and equipment. It is rare for universities to give preferential treatment to regional suppliers, especially those that are manufacturers and not simply distributors. Hence, a great deal of purchases may very well go to suppliers out of the region and the state.

In terms of revenue, it is true that the public university does play a key role in deriving income from outside the region, thus making a major contribution in bringing wealth into the region. For example, tuition paid by out of state residents or international students contributes to this type of income. Research grants to the university from outside the region also form a major factor of external income. Fee for service performed by the university for out of region entities also brings in external income. In Figure 1 are listed internal (within the region) and external (outside the region) sources of revenue and beneficiaries of expenses relative to a public university operation.

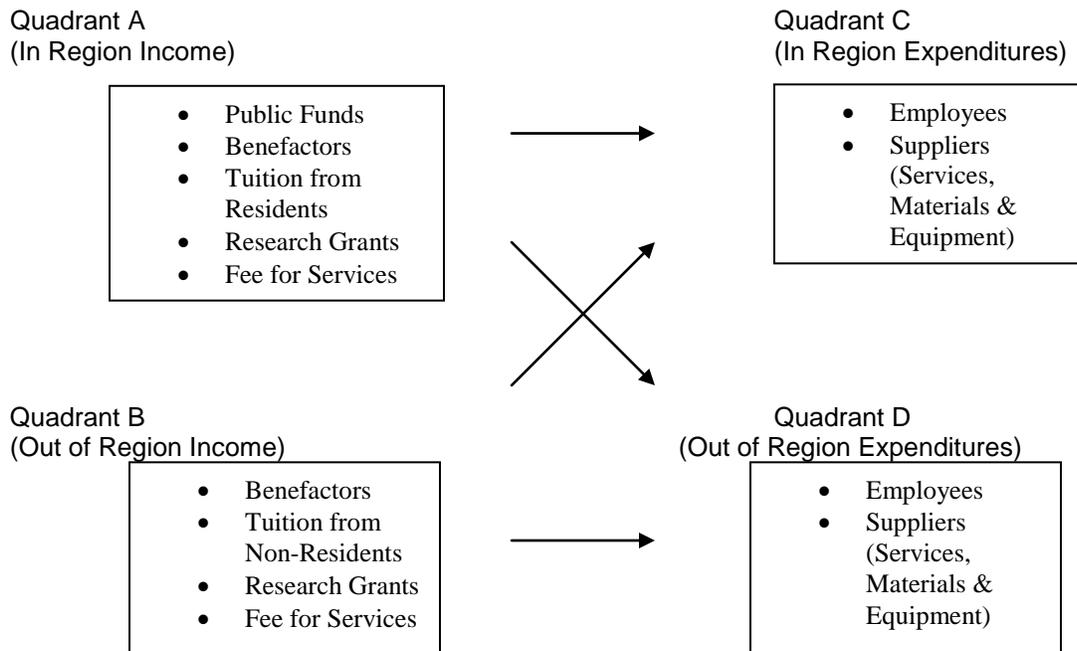


FIGURE 1
REGIONAL WEALTH MATRIX FOR A PUBLIC UNIVERSITY

Transition of Revenue to Expenditure at a Public University

It is seen that the transitions of AC and BC of Figure 1 retain capital inside the region and allow that wealth to circulate again. In contrast, transitions AD and BD take wealth out of the region. Taking in the whole transitional picture, the university will act as a “wealth builder” if

$$W(AC) + W(BC) > W(AC) + W(AD)$$

or $W(BC) > W(AD)$

Where:

- W(AC) – capital flowing from in region revenue to in region expenditures;
- W(BC) – capital flowing from out of region revenue to in region expenditures;
- W(AD) – capital flowing from in region revenue to out of region expenditures;
- W(BD) – capital flowing from out of region revenue to out of region expenditures;

In this case, more wealth is flowing into the region than what was sourced from the region. Since all the factors are positive, this really means that the university is attracting more net capital from outside the region than it is using in expenditures outside the region with in-region money. This can then be the metric for measuring the public university utilization of funds to assure it is a wealth builder as an enterprise.

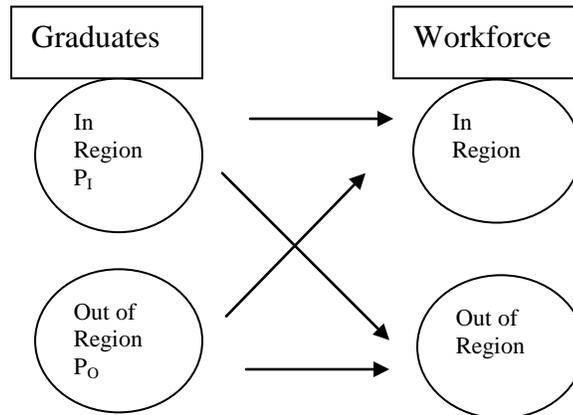
4. ECONOMIC DEVELOPMENT POLICY FORMULATION

Despite whatever criticism has been leveled at the public university in its pursuit of classical goals of “cultivation of the intellect” and “intellectual excellence” (Newman,1931), the public consensus is that the university is still highly capable of performing a careful study of almost any subject pertinent to the region’s welfare, including development of public policy in regional economic development. While the

factors of a region's economic growth are never under the influence of the university administration, the principal contribution of the university in regional economic development is to identify the region's competitive strengths in light of global market opportunities, mobilize the regional political and economic leadership and then act as a catalyst to forge an economic plan for the region. This plan can form the basis for public policy adopted by the regional or state legislative body and political leadership. Legal, business, technical, environmental and political (both local and global) issues can be addressed in the formulation of the regional economic plan. So broad and profound is the expertise in these and other areas at the public university that it is truly remarkable that it is often overlooked as the best resource for such an important project. Perhaps a reason for this lack of recognition is that universities are often "reactive" in nature, do not have a centralized contact for performing such projects, and its administration fails to maintain strong ties to the business, political, technology leadership of the region. There are federal agencies and non-profit organizations that have high interest in the "well being" of regions and are willing to invest time and resources into their economic improvement. However, regions that recognize opportunity and demonstrate high interest in improving their economic status are better able to attract the attention of these external resources. The opportunity can be spelled out in an economic development plan for the region as compiled with university resources. The match of these resources with a plan entails foresight, commitment and leadership from the university administration, emanating from its interest in improving the economic status of its investors and loyal constituents, namely the residents of the region. The metric that evaluates the public university in this role of economic development is basically the annual contribution it makes towards public policy formulation directly affecting the region's economic welfare.

5. WORKFORCE PREPARATION

The preparation of students at a public university to become productive members of the region's workforce is an activity often associated with an economic development contribution of a public university. The connection is easily made with the graduates of the "professional" schools – education, medicine, pharmacy, nursing, engineering, architecture, fine arts and business. However, many universities do not establish linkages to regional employers to find out (a) what the workforce needs are; (b) what changes in the curriculum are needed in order to address evolutionary requirements in regional jobs. Traditionally, universities have simply played a "reactive" role in the training and grooming of its graduates for professional jobs. Often there is no connection between the major industries in a region and their needs and the type of college graduate the university is outputting. This explains to some degree why a significant percentage of college graduates are forced to leave the region to find jobs while the regional industry has to import professionals from other regions to satisfy their personnel needs. At some universities as many as half of their graduates leave the region for employment even though only a small percentage of their graduates are from outside the region. What this implies is that educated talent is being shipped out of the region although local taxpayers subsidized its education. Sadly, this may mean that "the best young minds" of the region will not be party to regional wealth creation activities. In a sense, this amounts to wealth destruction in two ways, namely, local tax dollars were used to train the departing individual and second, bright regional talent leaves the region. In Figure 2 is shown the transitional process by which regional and non-regional talent enters the regional and non-regional workforce.



**FIGURE 2
TRANSITION MATRIX OF PUBLIC UNIVERSITY GRADUATES TO REGIONAL WORKFORCE**

The retention of university talent for regional needs is given by

$$RW = P_1 N * IE_1 + P_0 N * OE_1$$

Where

RW - No. of College Graduates Entering Regional Workforce

N – N is the Number of College Graduates in a given year;

P_1 – Percentage of In-region College Graduates;

IE_1 – Percentage of In-region College Graduates entering Regional Workforce;

P_0 - Percentage of non-regional College Graduates;

OE_1 - Percentage of non-regional College Graduates entering Regional Workforce;

Several metrics measuring year-to-year changes in workforce needs fulfillment are:

$\frac{\Delta(RW)}{\Delta t}$ - change of RW over one time period.

Δt

$\frac{\Delta(IE_1)}{\Delta t}$ - change of IE_1 over one time period.

Δt

The first metric is sensitive to the number of jobs being created in the region and how many of those jobs are being filled by university graduates. A positive value is good while a positive value greater than the number of the net new jobs created in the region is related to wealth creation since college graduates normally take higher paying jobs.

The latter metric measures improvement of retention of regional talent and channeling that talent to regional needs. Presumably IE_1 can never be driven to 100% since there will be regional graduates who wish to take on jobs that do not exist in the region. The objective in measuring the change in IE_1 is that native talent does not leave the region unnecessarily, especially the brightest college graduates who can become its leaders in business, government and education.

6. TECHNOLOGY TRANSFER AND COMMERCIALIZATION

Since the Bayh-Dole Act of 1980 that transferred ownership to universities of intellectual property created by federal funds the one activity that has been notably singled out and associated with economic development at a public university is technology transfer. There are many forms of technology transfer – licensing, joint ventures, research partnerships, etc. The form that creates jobs in the region, enlarges its

entrepreneurial pool and retains linkages back to continuing research at a university is the form in which faculty, researchers and students are involved in the creation, growth and retention of companies in the region. In the following is reviewed various aspects of the technology transfer activity at a university. Licensing revenue was envisioned to be a possible supplementary source of income for colleges with problems in funding, especially public universities. Unfortunately, this source of revenue has never realized its potential even after more than 20 years since the Bayh-Dole Act was passed by Congress. (See Figure 2-1 in Kalis, 2001) However, a private university, Columbia University in New York, has leveraged its association with medical research facilities and hospitals in the city to help develop intellectual property from which it receives record setting licensing revenues of nearly \$100 million per year. (Kalis, 2001, p. 5]

Besides increasing revenue through additional research grants, some colleges took an aggressive role in developing their intellectual property into commercial products and services. This initiative led to the creation of companies by university-sponsored programs that included campus-wide entrepreneurship activities, the use of endowment funds for investing in start-ups and in business incubation services. (Freid, 2003; Schmidt, 2002) Since 1980, over 2200 companies have been launched around university-associated technology and the rate of launch has increased in the past few years. Again a private university, MIT, has become a leading university in technology commercialization, has garnered over a 1000 patents, and receives nearly \$20M/yr in licensing revenues and is involved in some way in the launch of at least four companies per year. (Kalis, 2001, p. 3) Both Georgia Tech (public) and Rensselaer Polytechnic (private) launched in 1980 university based incubators that are still in existence and prospering today. Not all colleges embraced the idea of technology commercialization. Education and research, after all, were the long time objectives of the institution. However, it became clear over time that these objectives were being achieved in a way even more relevant and valuable to the college's constituents by participating and supporting technology commercialization. First, faculty, in association with the societal needs that commercialization satisfied, could now steer their research to topics more relevant and appreciated today. This led to greater self-satisfaction for those researchers who wished to solve problems of today rather than dwelling in the abstract. In other words, those researchers now saw the "relevance" of their work to an economic value for society. For students, commercialization of technology afforded work relevant to the needs of companies who became employer candidates. Companies saw in the student interns a form of productive and cheap labor. Students received "real" world experience that tied back to topics covered in the classroom. Companies, or more accurately, the commercial or industrial sector could write the homework problems for the students rather than the professor.

Commercialization of university technology is also an economic development activity that bridges the significant difference between the objectives of industry and the university. Where a commercial enterprise is measured by profitability, it focuses resources toward that goal by exhibiting an urgency to reach customers, satisfy them and be paid for products and services it provides. That behavior encourages taking risks in various company functions, hierarchical decision making, preset reward systems and protection of proprietary information from competition. The university, on the other hand, has a culture of open research and teaching, risk aversion, and decision-making by committees of faculty and administration that, in many cases, requires years to complete. The lack of success in commercializing university technology leads one to believe that research spending by itself does not translate into local economic growth. (Fried, 2003)

Untimely disclosure of a commercializable idea can destroy the possibility of a patent to protect it. Since faculty members are encouraged to publish their research findings as an important step towards promotion, recognition and the ultimate reward – tenure – universities frequently lose the value of idea creation that research dollars enable. The US Patent Office allows a patent application to occur up to a year after disclosure but foreign rights are gone once disclosure occurs.

Industry has had difficulty in adjusting to the absence of the sense of urgency in developing a commercializable idea with university personnel who are on the academic clock. Deadlines or project management generally are not part of the university vocabulary. Further, industry's needs form the commercializability aspect of the research. This implies a link between the university research and needs from the commercial world. Companies are willing to pay money for research that is based on their needs. The opposite is also true. Companies do not pay for research nor license technology not directly linked to the needs of the development of their products and services. That is possibly why some universities have failed in tech transfer programs. Their research was not conceived nor developed with a specific

industry's needs. The non-involvement of industry from the very beginning of university research will almost surely lead to non-interest of any discovery brought to its attention after the fact. Some states are passing legislation that would enable universities to allow companies to use university facilities more easily, thus over-riding laws that inhibit public subsidy of industry, or the "anti-donation" regulations. (Schmidt, 2002)

In summary, metrics that gauge the contributions made by the university to economic development in the form of technology transfer are listed in the Table 1:

| Activity | Transaction | Metric |
|---|---|---|
| IP Creation | Registration of disclosures, patent filings, trademarks, copyrights | <ul style="list-style-type: none"> • No. of faculty/researcher contributors • No. of Disclosures • No. of IP filings by type |
| University-Company Collaboration | Faculty/Researchers associated with company | <ul style="list-style-type: none"> • No. of Faculty/researchers involved • No. of companies participating in program |
| IP Licensing | Patents, trademarks and copyrights licensing by tech transfer entity. | <ul style="list-style-type: none"> • No. of contracts • Amount of Licensing revenue |
| Corporate sponsored Research | Research project funded by for-profit entity | <ul style="list-style-type: none"> • Amount of research dollars • No. of Companies sponsoring projects |

Table 1
Metrics for Technology Commercialization

7. ENTREPRENEURSHIP AND SMALL BUSINESS SUPPORT

Another area in which the university can play a major role in regional economic development is in fostering a campus culture of entrepreneurship and support of small business. The linkage between entrepreneurship, small business and economic development is creation of jobs. In the past fifty years, it is known that more jobs have been created by small companies in the US than by any other means, including company re-location, or by employment increases at Fortune 500 companies. The creation of companies is highly dependent on the availability of entrepreneurs (Mokry, 1988, p. 8). The definition of "commercial" entrepreneurship connoted here is a classical one – the process of creating a business based on satisfying a societal need with scant resources. At many universities the subject of entrepreneurship is taught at the business school but there has been a movement to disseminate the study to other professional schools such as fine arts, engineering, law and the health science fields. Courses that are taught in the non-business schools often have practicing entrepreneurs as guest lecturers if not instructors. Seminars, workshops and "boot camps" are held under university sponsorship to promote and propagate the knowledge and inspiration for founding companies among students, faculty members and researchers from many fields. Community involvement is often an important factor in the success of creating an entrepreneurship culture at the public university. Local economic development agencies support mentoring or internship programs for students or faculty. At times these agencies are associated with city, county or state funded business incubators where access to funding for start-ups is also available. UC-San Diego is noted for its CONNECT program that features meetings sponsored by the university that includes students, faculty, researchers, entrepreneurs, investors and professionals all interested in the creation of companies based on intellectual property that is associated with the university or other research installations in the area. Networking is an activity that a public university can sponsor and thus play a major role in fostering an entrepreneurial culture and support of small business in the region. Small companies are started by entrepreneurial teams often formed through networking activities.

Research has shown a strong correlation between business creation and university based entrepreneurial programs. Technology commercialization has also been shown to aid in faculty and student recruitment and retention. University based programs that lead to the creation of companies often have other benefits in economic development. An NBIA study released in 1999 of the 275 companies created by university intellectual property over 80% remained in the region. (Kalis, 2001, pp. 7-8) Hence, this activity has led to job creation in the local economy and tax dollars to local governments. Another side benefit is that university graduates have a chance to stay in the region rather than taking a job out-of-state. Incubation of university based start-ups increases the chances for their ultimate success and this function is a key ingredient in the recipe for universities to reap the benefits of technology commercialization. Incubators form a different activity within the university and must be treated as businesses with a bottom line – self-sustainability and success of its clients. University supplied services such as building space, business training, student and faculty interns, financial assistance often factor in the success of a campus-based incubator. Despite these impressive results, university-based incubation is not a common phenomenon. In summary, metrics for evaluating the efforts in entrepreneurship and small business support are summarized below in Table 2:

| Activity | Transaction | Metric |
|---------------------------------|--|---|
| Small Business Support | Student Involvement in Business, Marketing, Sales or Technology plans for small businesses | No. of Students participating per academic year each devoting more than 10 hrs/week. |
| Entrepreneurial Training | Coursework, Seminars, Workshop attendance | No. of Different students participating in at least 10 hours of training. |
| Company Creation | Business start by Faculty member or student. | No. of companies registered at university entrepreneurship center by faculty or students with non-zero revenue in last fiscal period. |
| Job Creation | Net new jobs created as part of company creation or growth | No. of net new jobs from companies registered by faculty and students. |

Table 2
Metrics for Entrepreneurial and Small Business Activities

8. BEST PRACTICES AND CONCLUSIONS

A set of best practices has emerged from the success that a few public universities have realized by playing a major role in regional economic development. First, university governance has to recognize the value of engaging in proactive regional economic development. A strategic plan with timelines and project management oversight should be developed for engagement that modifies curricula, pedagogy, faculty and staff reward systems, policy, operational support and financing. (Klein & Associates, 1998) Second, top administrators have to glibly articulate their support of programs, positions and management changes that lead to the benefits of conducting economic development activities at the university. Just as a President attends a football game to show support of athletic programs, attendance at economic development activities can be just as relevant. Third, students, faculty and staff have to be convinced that they are involved and will benefit from a more economically engaged university. Fourth, a feedback mechanism must be put in place to update the university's education and research machine as to its relevance to meeting regional needs in workforce development and business and industrial requirements for innovation in materials, services and processes for global competitiveness of the region.

8.1 Leadership

A proactive program in economic development goes a long way towards showing that a public university is taking the program seriously. The establishment of an office, institute or a center dedicated to

managing regional economic development programs at the university would be a start in enabling a new culture. The appointment of an endowed chair dedicated to leadership in economic development provides high visibility to other university constituents. Table 3 below outlines what duties the appointee might have and qualifications applicants for the chair would need to have.

Chair of Economic Development at a Public University:

Duties:

1. Chair the initial strategic plan for regional and state economic development activities at the university;
2. Coordinate economic development activities within the university colleges, schools and centers in compliance with a comprehensive and strategic plan of the university's role in regional economic development;
3. Act as Advisor to the University President, Cabinet and Board of Regents in matters of regional and state economic development;
4. Act as liaison to the state Office of Economic Development, EDA and other federal, state and city agencies on matters of economic development involving university activities;
5. Chair the Council for Economic Development at the university (consists of appointed members of faculty from every school and college at the university and aids in Duty No. 2)
6. Solicit grants and funds for supporting state or regional focused economic development activities within the university;
7. Encourage, support and reward work of university faculty, researchers, students and staff towards the diversification and strengthening of the economic sectors of the region;
8. Organize an annual conference on the economic development of the region in coordination with the other public research universities;
9. Establish and serve as Chief Editor for the *Journal of Regional Economic Development*, published quarterly by the university Press, soliciting quality articles on economic development activities and research conducted by regional organizations, foundations and university personnel.
10. Organize and establish community outreach programs for promoting, supporting and contributing to the economic development of the region;
11. Board member in the university sponsored business incubator;
12. Board member of tech transfer office at university; Member of Rewards Committee for "Best University Patent of the Year;"
13. Establish Alumni business mentor program for entrepreneurial teams in incubator
14. Establish Student internship program in incubator companies and in participating community based companies;
15. Establish seed funding contest for business plans by university faculty or student led companies;

Qualifications:

Education: PhD in economics, business, or technology field;

Research: Refereed publications in journals of applied technology, management science or industrial applications;

Experience: At least 10 years of industrial or commercial entrepreneurial experience in a managerial or executive role; Participation in economic development activities in a regional, state or national level.

**Table 3
Chair of Economic Development**

8.2 Faculty

University faculty members have traditionally been subject to reward systems at the public university that basically encourage publishable research and quality teaching – in that order. Service to the community is often encouraged but is rarely taken seriously in evaluating a faculty candidate for tenure. After successful completion of faculty duties over 3-7 years, tenure is awarded the faculty member and oversight for the level of research and teaching becomes one of "monitoring" rather than detailed annual evaluation. Despite what administrators or other university officials may desire from faculty, until the reward systems (including perhaps some aspects of tenure) are changed, faculty behavior modification is unlikely to occur. Few universities reward faculty for engaging in activities that are associated with economic development – assisting small businesses, creating companies, company board membership,

community development and planning, economic policy development for a city, county or region, etc. Until faculty members see that there is a payoff for them for such activities, it is doubtful that many will participate in them.

8.3 Policies

In addition, public universities normally require faculty members to devote 80% of their time to academic work during the nine month academic year – thus essentially leaving one day a week for non-academic work. This presents a problem to that faculty member who has entrepreneurial aspirations and requires more time for his/her business creation interests. Universities also impose a restriction on the use of university resources – buildings, equipment, students for the benefit of non-academic projects, especially those involving for-profit entities. These “anti-donation” restrictions limit or stifle altogether academic-business relationships vital to proper workforce development, community input to educational practices and course content and research directions in response to societal needs. New policies for faculty and student participation in the technology commercialization process must also be formulated and placed into service.

9. REFERENCES

- Arbo, Peter, & Eesknelinen, Heikki, “The Role of Small, Comprehensive Universities in Regional Economic Development: Experiences from Two Nordic Cases,” *Proceedings of 43rd ERSA Congress*, Jyväskylä, Finland, August 27-30, 2003.
- Fried, Vance H., “Venture Capital and the University: The Endowment’s Role,” *National Association of Seed and Venture Funds*, March 7, 2003.
- Kalis, Nanette, *Technology Commercialization Through New Company Formation*, Athens, Ohio: NBIA Publications, 2001.
- King, F. Alexander. “The Changing Face of Accountability: Monitoring and Assessing Institutional Performance in Higher Education,” *Journal of Higher Education*, 71, 2000, 411-431.
- Klein & Associates, “The Economically-Engaged University: A Strategic Issues White Paper,” *Presented to Bowling Green State University*, October 1998.
- Krueger, Alan B., & Lindahl, Alan, “Education for Growth: Why and For Whom?” *Journal of Economic Perspectives*, (Dec), 2001.
- Mokry, Benjamin W., *Entrepreneurship and Public Policy – Can Government Stimulate Business Startups?* Quorum Books, New York, 1988.
- Newlands, David, “The Role of Universities in Learning Regions,” *Proceedings of 43rd ERSA Congress*, Jyväskylä, Finland, August 27-30, 2003.
- Newman, John Henry, *Select Discourses from the ‘The Idea of a University*. University Press, Cambridge, MA 1931, p45.
- Schmidt, Peter, “States Push Public Universities to Commercialize Research,” *The Chronicle on Higher Education*, March 29, 2002.
- Selingo, Jeffrey, “The Disappearing State in Public Higher Education,” *The Chronicle on Higher Education*, February 28, 2003.
- Zemsky, Robert, “Have We Lost the ‘Public’ in Higher Education,” *The Chronicle on Higher Education*, May 30, 2003.

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