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*Higher Education and Economic
Competitiveness in a Global Economy*

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Traditional View of Primary
Economic Function of Universities



- ▶ Educating potential workforce
- ▶ Service to region, nation, etc.
- ▶ Basic research usually defined as the most important university variable

The Challenge



➤ Globalization, Digitization, and Regionalization

- An “Economic Tsunami,” but also a “Social and Political Tsunami”
- Experiencing “Great Change” matched only by the Industrial Revolution

The map for the future of higher education strategy is radically different than that of the past.

According to NSF 2004



▶ US losing ground:

- The number of U.S. authored articles is flat
- The percentage of U.S. authored articles has declined
- Aerospace industry market share declining
- Intellectual property leadership eroding

According to NSF 2006



Between 1992 and 2003, U.S. growth in article output “was markedly slower than in other major S&E publishing regions and remained essentially flat. . .despite continued growth of research inputs.”

According to the Center for Strategic & International Studies (Lewis, 2005)



Innovation in areas critical to our national and homeland security are increasingly likely to occur outside the U.S. . . .the possibility of rapid scientific advance in another nation at the same time the U.S. is slowing basic research creates a new and troubling...risk for the United States.

The Economic Impact of R&D?



... It would have taken an increase of US \$10 million in research expenditures among universities in an 'average' MSA to increase the index of average earnings per job by 0.36 .

(Goldstein and Renault, 2004: 744)

Current Status – U.S. R&D

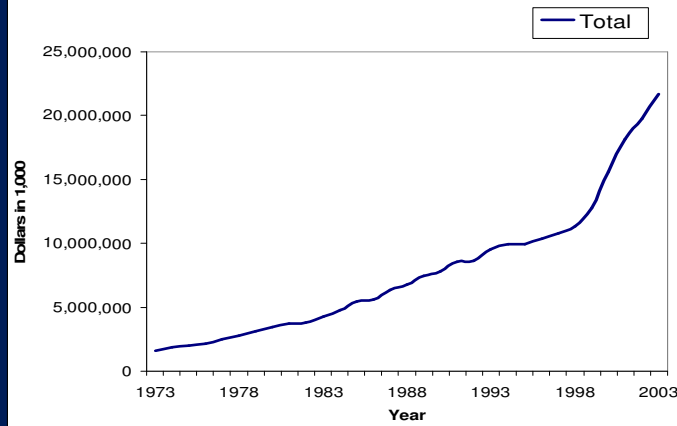


- ▶ Half of U.S. publications are in the life sciences, whereas researchers in other locations are concentrating on the physical sciences
- ▶ Three-quarters of private sector R&D funding goes to development, not basic research
- ▶ The US now ranks 17th in the number of 18-24 year-olds earning natural science and engineering degrees

According to Rad*ius Data (RAND)



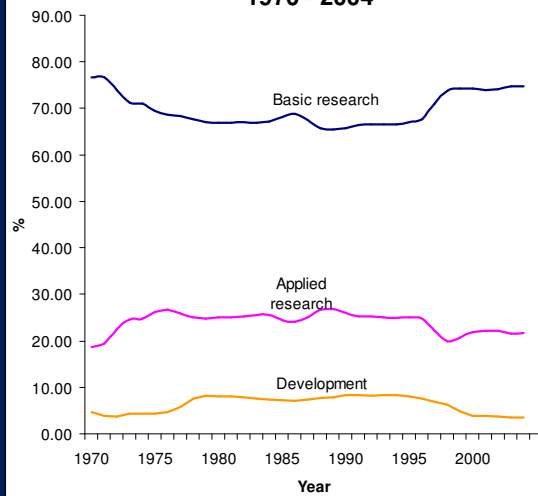
Federal R&D to University and College: 1973-2003, Total



% Expenditure of R&D (NSF 2006)

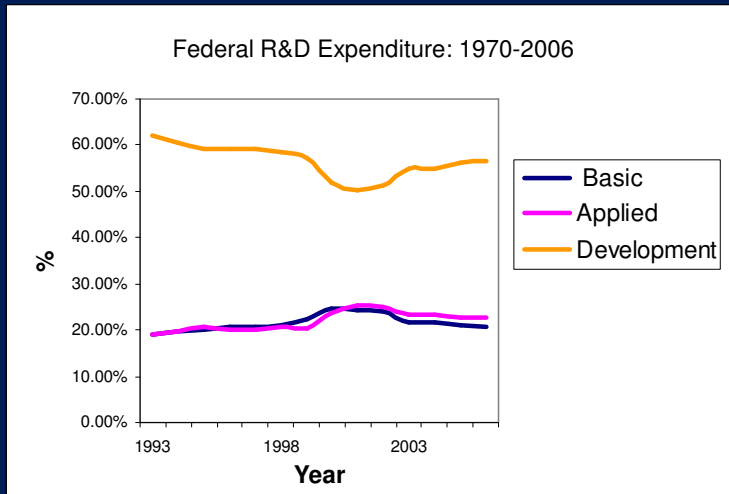


Academic R&D Expenditures
1970 - 2004



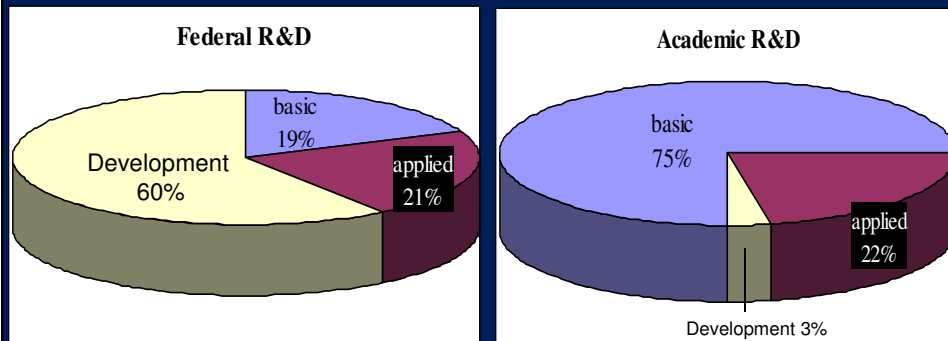
Current university expenditures:
Disproportionately
Big "R"
&
Little "d"

% Expenditure of R&D



NSF 2006

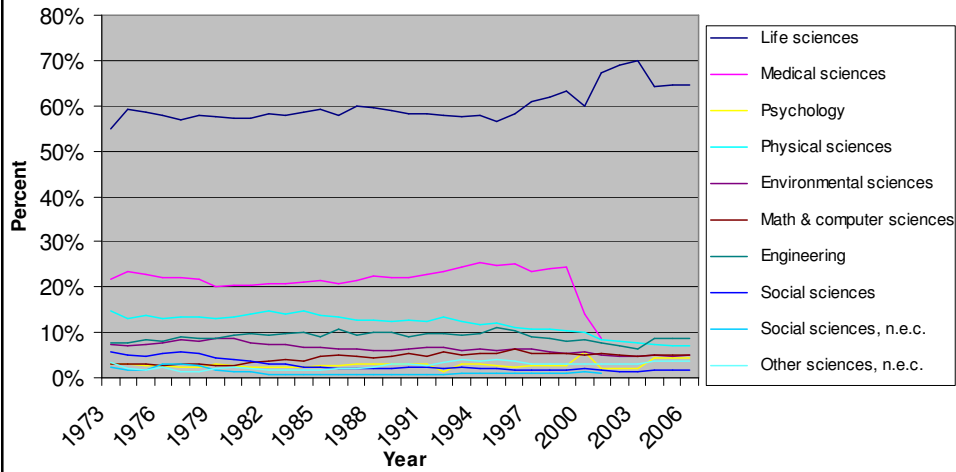
Difference between Federal and Academic Expenditures (NSF 2006)



Distribution of Academic R&D Funds



Federal R&D to Universities and Colleges: 1973 -2006



What is the Economic Effect? (Based on SBA data)



Variable	I	II	III	IV
Population Log	.85	-.01	.22	.02
Population Change	.17	-.012	.77	.15
Establishment Density	-.08	.88	.16	.07
Establishment Size	.65	-.34	-.26	.40
Unemployment Rate	-.22	-.56	.27	-.59
High School Graduation Rate	.43	.74	-.03	-.01
College Graduation Rate	.75	.55	.18	-.03
Foreign Population	.48	-.10	.59	-.20
Trend	-.05	.01	.10	.85
R&D Investment	.73	.24	.03	-.03
New Business Formation	-.16	.47	.75	.11

What Trends Emerge?



Trend I

R&D is concentrated in LMAs with large stable populations; with economic bases dominated by large businesses; and educated labor forces

Trend II

New businesses evolve most rapidly in growing LMAs or in LMAs with large numbers of small businesses (SMEs) and highly educated workforces

Why?



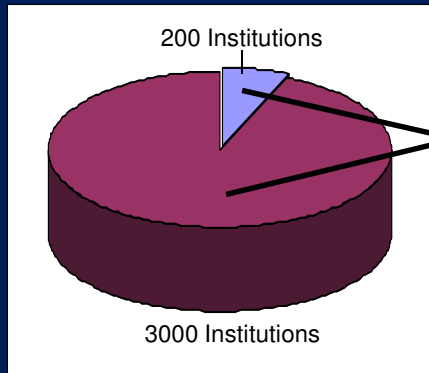
- ▶ The top 200 institutions account for approximately 96 percent of all R&D expenditures;
- ▶ Top ten institutions account for approximately 17 percent of all R&D expenditures;
- ▶ Institutions ranked between 101 and 200 accounted for approximately 20 percent of R&D.

(NSF 2004 data)

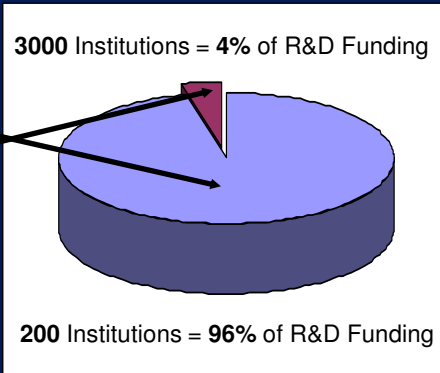
Why?



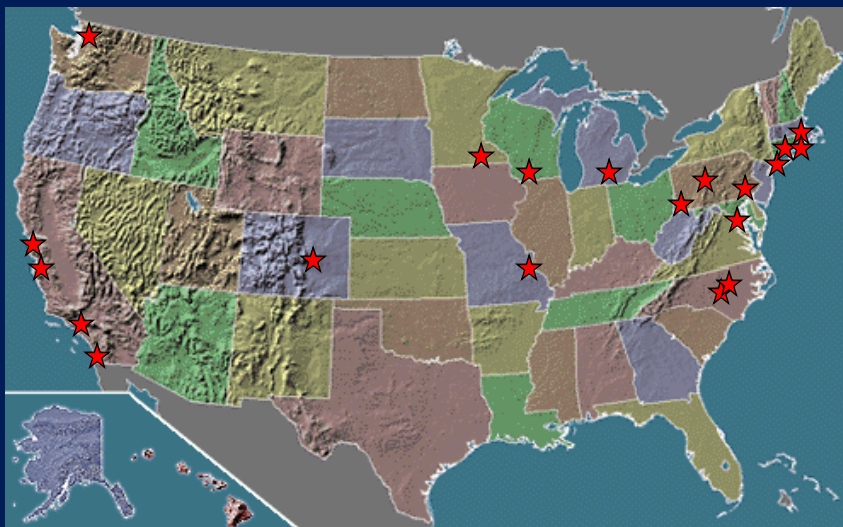
Higher Education Institutions



Funding

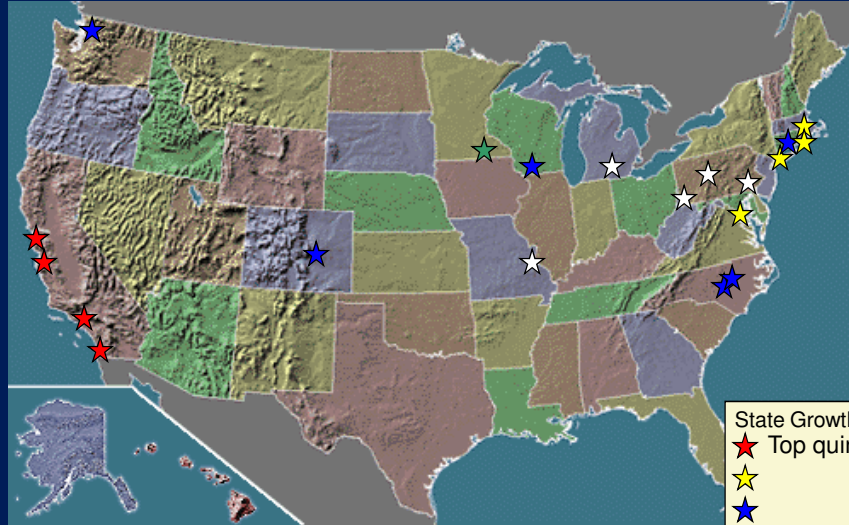


Location of Top 20 Federally-Funded Science & Experimental R&D



University S&E Distribution by Economic Growth Rate

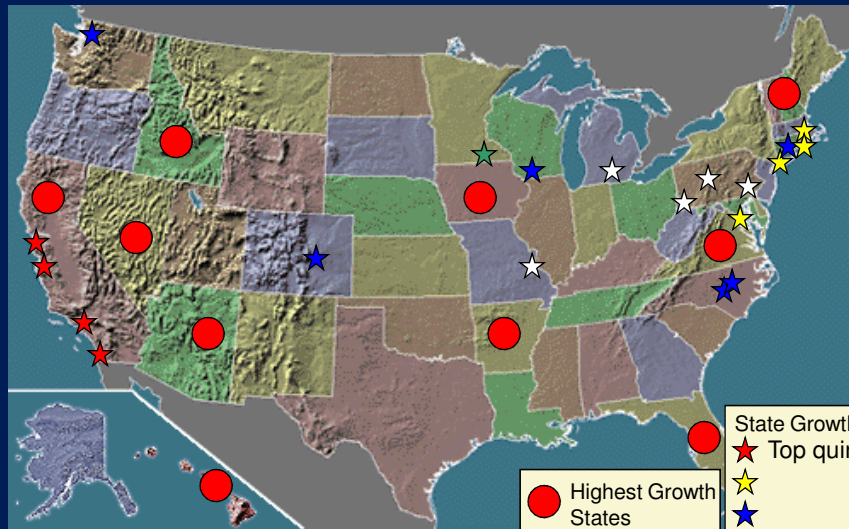
(Quintiles) (NSF 2004; US BEA 2004)



- State Growth Rate
- ★ Top quintile
 - ★
 - ★
 - ★
 - ☆ Bottom quintile

High Economic Growth States in Relation to Top 20 S&E Universities

(Quintiles) (NSF 2004; US BEA 2004)



- State Growth Rate
- ★ Top quintile
 - ★
 - ★
 - ★
 - ☆ Bottom quintile
- Highest Growth States

Linear Model of R&D: Vannevar Bush



“The Technological Sequence”

Basic Research Applied Research Development Production



How many decades?

Re-Conceptualizing the Research Enterprise



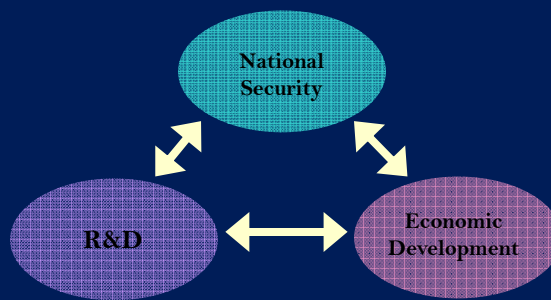
- ▶ Instead of the linear model, we need a four-fold model of science
- ▶ There is a false dichotomy between basic and applied research

Four-Fold Model of R&D

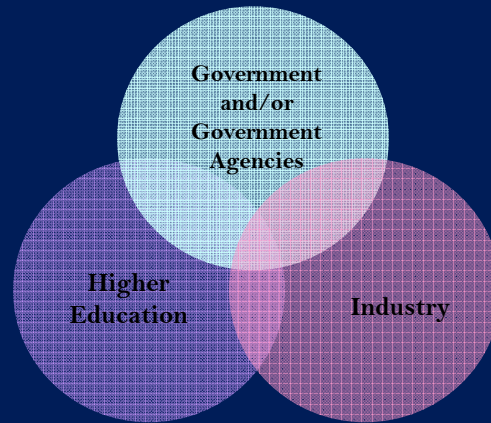


	Basic	Applied
Purpose-Driven	Pasteur	Edison
Knowledge-Driven	Einstein	Darwin

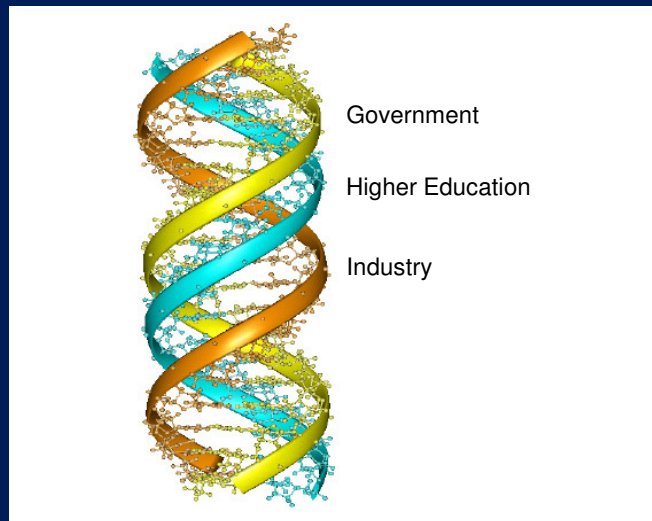
Insight for R&D Policy Direction



Needed: R&D Policy Integration



Triple Helix Model



Considerations for R&D Funding Distribution



- ▶ Globalization has created a national security environment that requires more rational distribution of R&D funding
- ▶ R&D funding must take into account the structure of regional economies
- ▶ R&D must be linked to expected outcomes (Pasteur's quadrant)

Why is Considering the
“Regional Landscape”
Important?



Dual Economic Trends



Globalization



Regionalization

Nature of Economic Regions



- Economic regions are functional and reflect changing economic conditions
- Economic regions do not necessarily reflect political or cultural lines
- Each economic region can be defined in relation to its “economic potential” and “location”
- One estimate of “economic potential” is Porter’s “Clusters of Innovation”
- To develop effective policy and effective use of resources, clusters must be “fractionalized”—that is not regularly being done
- As a result, most “regional vision” plans look very similar

Critical Role for University: Building Regional Competence



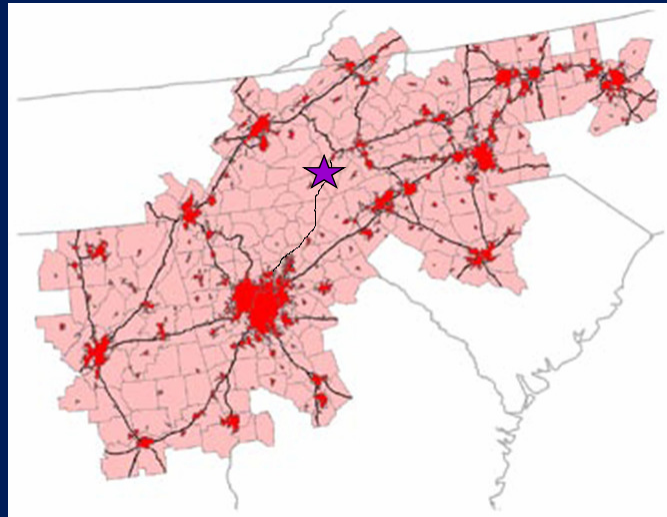
- Competence refers to the ability of a region to respond to economic opportunities and rapidly changing global conditions
- Competence refers to the range of abilities, characteristics, and resources available in the region and the *effective linkages* of that region with resources from the systems of which that region is a part
- Specific skill sets required to create competence will vary by situation; the general issues are common to all regions
- Resource need analyses are not conducted regularly at either the federal or state level to understand what is required to build regional competence

Megapolitans by 2050



2005 Metropolitan Institute at Virginia Tech

Regional Conditions: South Piedmont Megalopolitan



What factors matter in regional economic competitiveness?



- **Distinct regional assets**
 - Financial capital
 - Business, cultural, natural and social amenities
 - Broadband connectivity
- **Recognition and use of regional economic drivers and multi-state collaborations (Clusters)**



What about the “Creative Class”



- ▶ Richard Florida’s notions that one must attract the “Creative Class” if one is to successfully compete in the global economy
- ▶ Creative Class attracted by its “lifestyle preferences”
- ▶ Key variables:

Attract the Creative Class



“... by supporting the creation of hip eateries and cafes, music and performance venues, unique shops, and eclectic, culturally diverse entertainment venues”

Donegan, Drucker, Goldstein, Lowe, and Malizia, JAPA, 74,2, 2008: 180-181.

Florida's Variables



- ▶ Creative Class as percent of workers
- ▶ Measure of high tech industrial output
- ▶ Bohemian Index
- ▶ Melting Pot Index
- ▶ Gay Index

Traditional Variables



- ▶ Educated adults in the workforce
- ▶ Manufacturing as a percentage of earnings
- ▶ Business Services
- ▶ Percent earnings from proprietorships

Dependant Variables



- ▶ Percent change in number of jobs
- ▶ Percent change in income
- ▶ Job stability

General Conclusions Relevant to Kansas



Generally, creative class variables do not predict as well as traditional economic development variables. Two exceptions:

- ▶ Presence of creative class associated with job instability
- ▶ Increased diversity related to increased jobs

What is the Economic Effect? (Based on SBA data)



Variable	I	II	III	IV
Population Log	.85	-.01	.22	.02
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Taking a Regional Approach



- ▶ There are many definitions of region and there is not consistency among perspectives
- ▶ Economic regions tend to be functional, not formal, and they tend to shift with changing conditions
- ▶ There may be no relationship between economic and other regions including social, cultural, and formal regions

Concept of Region



For this discussion, the assumption is that Universities are free to use changing functional regions in their approach to regional development. Key is the notion of “region of knowledge”

Regions of Knowledge



- Innovation is regionally bound; U.S. and European research suggests a functional region of innovation of 75 miles or less
- According to a new (March 29, 2006) Kauffman Foundation study:
 - Scientist location can influence the decision to commercialize ... as Jaffe (1989), Audretsch and Feldman (1996), Jaffe, Trajtenberg and Henderson (1993), and Glaeser, Kallal, Sheinkman and Shleifer (2002) show, knowledge tends to spill over within geographically bounded regions. (Audretsch, 2006: 29)
- It is unlikely, therefore, that investments in any one university can influence the prosperity of the state
- To impact regional innovation requires a thoughtful policy linking regional potential, regional competence, and investments in infrastructure, regional facilities, and regional education institutions

Target Enablers: Commercialization



- Commercialization is effective if it produces:
 - New jobs
 - Higher wages
 - Successful business start-ups
 - Increases existing business competitiveness

- Four forms of commercialization:
 - Patents/selling patents
 - Licenses
 - New business start-ups
 - SBIR

- University support system
 - Culture that endorses commercialization and industry relationships
 - Reward system for engaging in strong relationships with industry
 - Hiring practices that give preference to faculty with experience in industry relationships
 - Job assignments that reflect value of innovation, entrepreneurship, and commercialization

America's Key Growth Engines of the Future - Entrepreneurship & Innovation



- Underlying both concepts is the need for education that:
 - Promotes and trains creativity
 - Enables applied learning
 - Drives applied research
 - Ensures skills for business creation
 - Infuses technology into the learning process

Barriers to Success



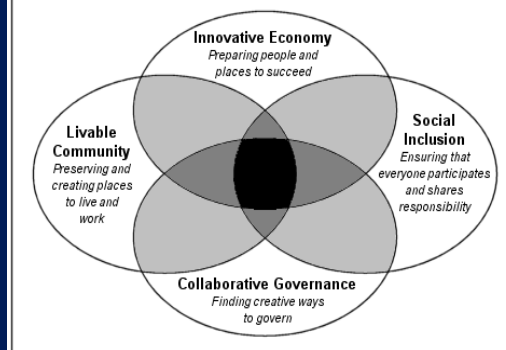
- Few studies of functional economic regions
- Political regions do not necessarily include all parts of a functional economic region
- No systematic studies of cluster fractionalization
- Policies do not address functional regions that cut across state lines
- Impact of higher education and regional development is not understood

Implications: Investments in higher education and economic development are not as targeted and effective as they might be if policy were linked to the actual structure of economic regions

Critical Role for University: Regional Stewardship



Framework for Regional Stewardship



Source: American Association of State Colleges and Universities

Target Enablers: Faculty and New Business Start-ups



- Institutional culture critical at both the university and departmental level
- Faculty who studied with professors who had a positive attitude toward commercialization more likely to commercialize
- Data from U.S. and Germany suggest that most prominent research-centered scientists do not successfully engage in new business start-ups:

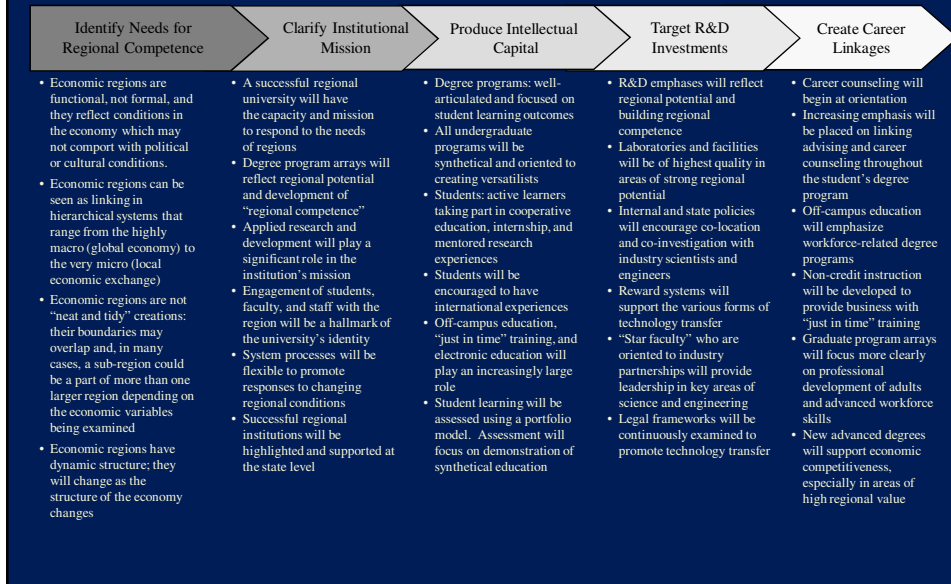
The negative and statistically significant coefficient of scientist citations suggests that more highly cited scientists have a systematically lower propensity to become entrepreneurs (Audretsch, 2006: 48).

Cluster of Innovation Meta-Themes: Emerging & Driving Forces



- Advanced manufacturing and materials
- Computer Systems, modeling/simulation, and software
- Molecular biochemistry applied in areas including bio-systems and forensics
- Interactive and other electronic media
- Health and aging
- Business support, innovation, and entrepreneurship
- Security-related applications
- Advanced education and training related to high level career development

Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



Identify Needs for Regional Competence

- Economic regions are functional, not formal, and they reflect conditions in the economy which may not comport with political or cultural conditions.
- Economic regions can be seen as linking in hierarchical systems that range from the highly macro (global economy) to the very micro (local economic exchange)
- Economic regions are not "neat and tidy" creations: their boundaries may overlap and, in many cases, a sub-region could be a part of more than one larger region depending on the economic variables being examined
- Economic regions have dynamic structure; they will change as the structure of the economy changes

Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



Clarify Institutional Mission

- A successful regional university will have the capacity and mission to respond to the needs of regions
- Degree program arrays will reflect regional potential and development of “regional competence”
- Applied research and development will play a significant role in the institution’s mission
- Engagement of students, faculty, and staff with the region will be a hallmark of the university’s identity
- System processes will be flexible to promote responses to changing regional conditions
- Successful regional institutions will be highlighted and supported at the state level

Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



Produce Intellectual Capital

- Degree programs: well-articulated and focused on student learning outcomes
- All undergraduate programs will be syncretical and oriented to creating versatilists
- Students: active learners taking part in cooperative education, internship, and mentored research experiences
- Students will be encouraged to have international experiences
- Off-campus education, “just in time” training, and electronic education will play an increasingly large role
- Student learning will be assessed using a portfolio model. Assessment will focus on demonstration of syncretical education

Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



Target R&D Investments

- R&D emphases will reflect regional potential and building regional competence
- Laboratories and facilities will be of highest quality in areas of strong regional potential
- Internal and state policies will encourage co-location and co-investigation with industry scientists and engineers
- Reward systems will support the various forms of technology transfer
- “Star faculty” who are oriented to industry partnerships will provide leadership in key areas of science and engineering
- Legal frameworks will be continuously examined to promote technology transfer

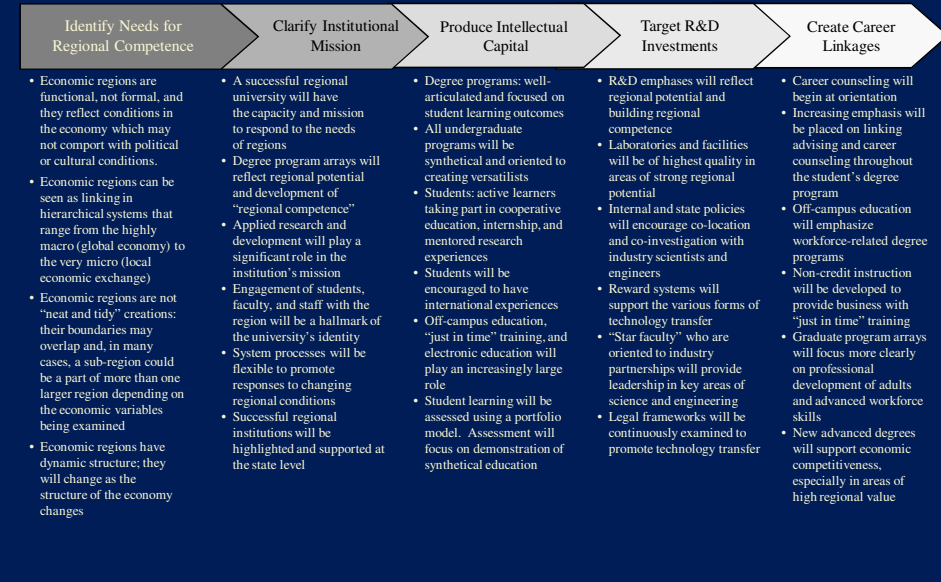
Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



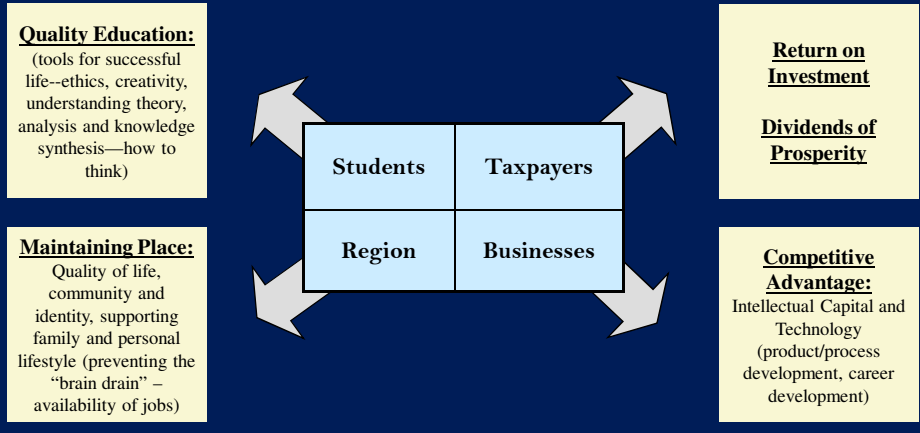
Create Career Linkages

- Career counseling will begin at orientation
- Increasing emphasis will be placed on linking advising and career counseling throughout the student’s customized degree program
- Off-campus education will emphasize workforce-related degree programs
- Non-credit instruction will be developed to provide business with “just in time” training
- Graduate program arrays will focus more clearly on professional development of adults and advanced workforce skills
- New advanced degrees will support economic competitiveness, especially in areas of high regional value

Higher Education Winners Will Base Strategic Plans on Multiple Decision Points



Higher Education Winners Address Client Value Propositions



Value Proposition for State: Global Competitiveness

Institutional Priorities



- Education
- Full range of scholarship
- Knowledge community
- Resource development
(enrollment, partners, funding)

Millennial Initiative

Building Toward the QEP



The Quality Enhancement Plan (QEP)



“Synthesis: A Pathway to Intentional Learning”

Purpose: Provide an educational experience where students integrate knowledge, skills and co-curricular activities that result in:

- Deeper levels of learning
- Establishing relationships among seemingly disparate experiences and content
- More meaningful and rewarding career choices
- Understanding of one’s role in society and the desire to be civically engaged

Major Components & Key Elements of the QEP



Major Components

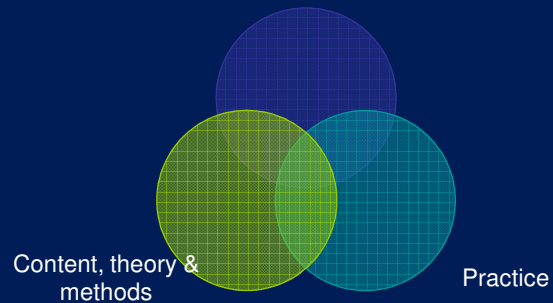
- ▶ Self Exploration and Career Planning
- ▶ Knowledge Acquisition and Experiential Learning
- ▶ Synthesis

Key Elements

- ▶ Personal and Career Assessment
- ▶ Instruction/Coursework
 - Engagement
 - Integration
- ▶ Mentoring to Guide Reflection and Growth
- ▶ Engagement Activities Related to the Curriculum
 - Internships and Co-ops
 - Undergraduate Research
 - Service Learning
- ▶ Assessment of Learning Outcomes
- ▶ The Educational Briefcase



Reflection



WCU's Revised Scholarship Standard

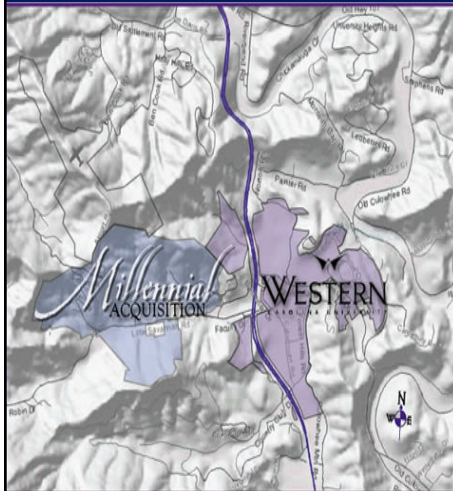


“Faculty members should demonstrate that they are current and scholarly in their disciplines as reflected in the ways they teach and serve. They are also expected to demonstrate regular activity in one or more types of scholarship outlined below”:

The four types of scholarship from Ernest Boyer's model include:

- Scholarship of discovery
- Scholarship of integration
- Scholarship of application
- Scholarship of teaching and learning

Millennial Campus

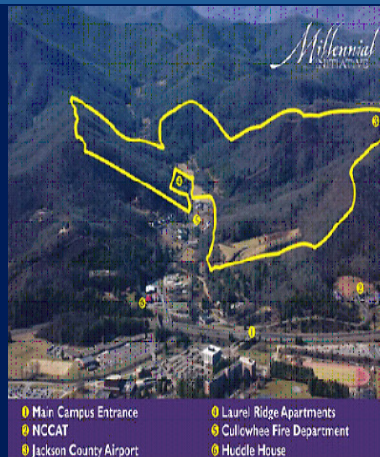


Engage private businesses in an effort to **foster public-private partnerships** ultimately co-locating on the Millennial Campus. Locating private businesses at WCU will enable **students to gain valuable first hand experience** in real-world situations, allow faculty to stay current in their respective field, and offers the businesses access to first class academic resources, faculty and students. Additionally, these **businesses will stimulate high-tech, high-salary job creation** in our region.

Millennial Initiative



- 680 total acres of land
- 344 acres for development as a mixed land use, public-private partnership campus (not 2 campuses)
- Will involve creating an “academic community” instead of a traditional technology or science park
- Eva Klein and Associates, a nationally recognized university development firm leads planning effort



Millennial Campus



The millennial campus will serve to create value-added high-technology jobs through university-private partnerships, resulting in new business development.

Campus Suitability Map



Potential Building Sites



Quad Circulation



Potential Parking Garage Location

Millennial Planning



- Identification of potential new building sites
- Develop Main Campus & Millennial Campus as one large campus
- Develop master plan recommendations for campus entrance
- Look at connection of Millennial and Main Campus
- Retain community identity for the campus
- Enhance & reinforce pedestrian image
- Plan with Vista's & Viewsheds in mind
- Incorporation of Campus Art Display locations
- Identify key Open Green Spaces
- Incorporate the Heritage Trail within the pedestrian corridor design process
- Look at bike routes within the campus and connections to regional greenways

Millennial Planning



- Look at affects of an increase in student population to 16,000 FTE students in next 5-10 years
- Identify third party Conference Center locations
- Look at concentration of new student housing for ease of shuttle routing options
- Increase student gathering & networking spaces to heavily used academic areas
- Maintain or improve campus safety for nighttime pedestrians
- Develop Low Impact Design & Environmental Design Standards
- Preserve Natural/Mountain Identity
- Identify Potential Environmental Restorations

Millennial Campus Summary



- Provide a seamless integration to main campus; as an extension of WCU main campus
- Provide an interconnection to the Main Campus (visually and through pedestrian and vehicular connectivity)
- Connect and link of the two campuses
- Develop a mixed use Town Center with housing, hotels, civic, commercial and retail uses
- Provide landmark Gateways to both campuses
- Provide and strengthen Regional Connections to the airport, highways and expand telecommunication capabilities
- Enhance and reinforce Community Identity of WCU

Millennial Campus Summary



- Develop a Pedestrian Friendly Campus
- Promote opportunities for Public / Private Partnerships
- Preserve Viewsheds and Open Spaces
- Identify Developable Building Sites
- Provide spaces where people can meet, work and play
- Identify possible Low Impact Design Standards for topography, floodplain, stormwater management, and infrastructure
- Identify adjacent parcels for acquisition & expansion
- Develop Phasing Plan for implementation



Result: A different kind of university, linked to what the world will require of us



Result

A different kind of university, linked to what the world will require of us