

North Dakota State University
and
NDSU Research and Technology Park

Research and Innovation Strategy
Report of Phase 1—Assessment and Strategic Directions
May 2014



Prepared for:

NDSU | RESEARCH AND TECHNOLOGY PARK

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Strategies for the Global Knowledge Economy



May 21, 2014

Dr. Kelly Rusch, Vice President for Research and Creative Activity
and
Mr. Chuck Hoge, Executive Director, NDSU Research and Technology Park
North Dakota State University
Fargo, ND 58102

Dear Dr. Rusch and Mr. Hoge:

With this letter, Eva Klein & Associates is pleased to transmit our report—*Phase 1 Assessment and Strategic Directions for Research and Innovation at North Dakota State University and NDSU Research and Technology Park*—performed under EKA's services agreement with NDSU Research and Technology Park.

Report Organization

With a combination of hard data, qualitative interview data with more than 100 stakeholders, and our own observations in context of our national experience, there was a large body of information to cover in this *Assessment Report*. We have done our best to organize the voluminous information in a user-friendly fashion. Section 1 summarizes the objectives and work of this study. Sections 2 through 6 provide several *Contexts* for this *Assessment*. Sections 7 through 11 provide the *Assessment*. Of these, Section 11 provides EKA's *Conclusions* and preliminary *Strategic Directions*. In Section 12, exhibits provide additional, supporting material.

Current Assessment—NDSU Research and Innovation and NDSU RTP

As is the case with assessments, our review led to many positive conclusions, and a few less positive. We have sought to present a complete, balanced view of the state of *Research and Innovation* and the *Research and Technology Park* today, including relevant North Dakota, regional, and university contexts—all provided as the baseline you sought for undertaking future planning.

Looking Forward—Possible Strategic Directions

In accordance with our Phase 1 assignment, the *Strategic Directions* presented in this *Report* are a beginning, not an end. These *Strategic Directions* are offered as an informed but *straw man* framework with which to begin the real work of evaluating alternatives and deciding about future *Research and Innovation* goals and strategies. It is our hope that having this Phase 1 work as a point of departure should make it possible to focus NDSU's strategic dialogue effectively, on the right questions that need answers, and thus enable the University to craft a *Strategic Plan for Research and Innovation* in a reasonable timeframe.

It has been a pleasure to work with the wonderful people of NDSU and the RTP, and their many North Dakota stakeholders—particularly because this is a moment not only for celebrating successes to date, but also a time for great optimism about the future—an optimism that we found thoroughly infectious. We are eager to continue to support the University and the RTP in advancing NDSU's 21st century agenda for *Research and Innovation*.

Very truly yours,



Eva Klein

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NDSU Research and Innovation Strategy Phase 1—Assessment and Strategic Directions

The Assessment Report

1—INTRODUCTION TO THE STUDY

This is the report of *Phase 1—Assessment and Strategy Directions*, in a planning initiative that was designed to occur in two phases.

- Phase 1—*Assessment and Strategy Directions*
- Phase 2—*Strategic Plan for NDSU Research and Innovation and NDSU Research and Technology Park (RTP)*.

Phase 1 Objectives

The objectives for Phase 1 were to:

- Familiarize the consultant team with NDSU and its stakeholders and contexts
- Organize a *Symposium* for university and other local stakeholders on *innovation and innovation ecosystem strategies* nationally, and provide other university examples
- Collect and review relevant data about the university, local / state industry, existing investments / programs, and existing economic development strategic plans
- Assess current context, programs, funding levels, and metrics of accomplishment in *Research and Innovation*
- Provide a first draft / outline of possible future strategies / directions, including *candidate* areas of high-priority for research growth and special investments, and a first attempt at stating *stretch goals*.

NDSU Innovation Symposium

Governor Jack Dalrymple and NDSU President Dean Bresciani opened the *NDSU Innovation Symposium*, held on December 13, 2013 at the FARGODOME. NDSU Provost Bruce Rafert and Vice President for Research Kelly Rusch also provided remarks.



Phase 2 Objectives

Building on Phase 1, the objectives of Phase 2 are to:

- Confirm or elaborate on selected data, based on initial data reviews in Phase 1, to the extent that data are required to support the planning dialogue,
- Enlarge the planning dialogue to include key stakeholders whose buy-in matters and, with them, properly vet (or refine) the *Strategy Directions* (e.g. Research and Innovation areas of priority, quantified goals / metrics, etc.)
- With goals and strategies identified and agreed-upon, develop key tactics and business elements to form a *Strategic Plan for NDSU Research and Innovation* (including *NDSU Research and Technology Park*).

Phase 1 Methods / Tasks

Phase 1 methodology centered on collection of statistical and qualitative data about NDSU and the RTP; an analysis / assessment of strengths, weaknesses, opportunities, and challenges—in context of national trends and innovation strategies of other universities; and a first formulation of possible future strategies.

Specific tasks were:

- Task 1: Project Organization
- Task 2: Review of Statistical Data and Extant Strategic Plans, including strategies being developed by the Valley Prosperity Partnership (with Fourth Economy Consulting)
- Task 3: Initial Project Meeting, Campus/Park / Area Tour, and *Innovation Symposium*
 - Task 3.A: Initial Project Meeting
 - Task 3.B: Facilities and Community—Visit / Tour
 - Task 3.C: Symposium on *Innovation and University Innovation Ecosystems*
- Task 4: Stakeholder Interviews
- Task 5: Integrated Analyses and Draft Deliverable: *Assessment and Strategy Directions*
- Task 6: Presentation / Dialogue—*Assessment and Strategy Directions*
- Task 7: Final Deliverable—*Assessment and Strategy Directions*.

Interviews

Exhibit 1 is a list of the 108 persons interviewed in Phase 1. These included a mix of individual interviews and focus groups. Most were on-site in Fargo or Bismarck; a few were conducted by telephone.

The EKA Consultant Team

This work was carried out under direction of Eva Klein, with EKA consulting associates, Steven A. Spalding and Maureen Klovers.

Eva Klein & Associates, Ltd. (EKA) is a consulting practice that supports higher education clients in **design of strategic visions; business models/operational planning; and implementation of strategies**. EKA provides technical expertise, planning facilitation, and creative strategy formulation—all aimed at helping institutions advance their accomplishments and their service to constituents.

EKA Services to Universities

Sustainable Business Models

Strategic Planning

Capital Facilities and Campus Planning

Financial and Resource Planning

Policy Analysis and Development

Organization and Management Studies

University Engagement, Innovation, Regional Economic Development

Economic Engagement Strategies of Institutions

Regional Alliance Strategies

Innovation Systems

Innovation Campuses / Parks or Knowledge Communities

Sustainable Business Models for the 21st Century University

As funding pressures cause institutions to seek new business models, EKA seeks to help college and university clients design new ways of getting and using resources more effectively and productively.

University Engagement, Innovation, Regional Economic Development

EKA also helps institutions reposition themselves as pivotal forces in their communities, regions, and states—to support competitiveness in the *Global Knowledge Economy*—while also sustaining scholarship and developing and applying new knowledge to address global and local problems. Although the professional services landscape has changed in recent years, no US professional consulting firm has focused on **university roles in economic development and regional engagement and innovation strategies** for the last nearly 30 years, as EKA has.

2—CONTEXT: TRENDS IN UNIVERSITY INNOVATION STRATEGIES AND PLACE-MAKING

Our Institutions' Roots

In several decades following World War II, US universities carried out a 20th century version of the centuries-old model of the university as an Ivory Tower of learning and discovery. While universities always were essential to our society, in the advanced *Industrial Economy*, most of the US workforce still was prepared at the level of high school diplomas; at mid-century, after World War II, only 6.2 percent of the US population had a college degree.¹ (Today, among those 25 years old+, 28.5 percent hold a bachelor's degree or higher.)²

One significant change from the 19th century has been the addition of new disciplines. But, from the late 19th century through mid-20th century, there were only two *meta-ideas* that substantially altered the traditional institution models: (1) the **land-grant colleges**, with experiment stations and extension services and (2) **community colleges**. Significantly, both those models were designed to alter the Ivory Tower culture—handed down for centuries from the earliest universities. In one case, the purpose was clearly economic, to bring new knowledge into agriculture and mechanical/industrial arts. In the other case, the purpose was to extend educational opportunities into communities and to non-traditional learner populations. Liberal arts colleges, regional universities, and research universities for the most part have continued, until recently, as quite traditional in their focus on full-time 18-26 year old students and in their focus on traditional scholarship in the academic disciplines.

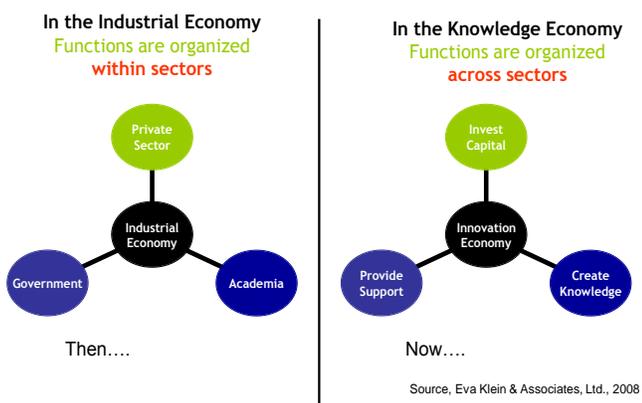
Evolution of the Research and Innovation Mission and Roles

Under National Science Foundation (NSF) leadership, the US's post-WWII research model defined roles for academic, private, and government sectors, approximately as follows:

- Universities and Not-for-Profits—**Basic Research**
- Corporations—**Applied Research** (and Product Development)
- Government—**Mission Research** (Energy and Defense).

That division of sector responsibilities worked exceptionally well in the late-stage *Industrial Economy*. Now, with globalization, the sector model is being replaced by models that include two, or all three, sectors in new forms of research collaborations.

Transformation of Sector Roles to Functional Integration



Also, unidirectional progression from basic to applied research is no longer the only pathway. And the practice of individual principal investigators is no longer the only typical way in which research is organized, funded, and performed. There is a marked trend toward *big research* with *big multi-entity teams*, with *big data analytics* being an essential component.

Symposium Presentation

Eva Klein's *Symposium* presentation was an effort to trace these developments and define characteristics and examples of *university-centric innovation strategies / models*. To augment this very brief discussion, the entire set of presentation frames is provided as Exhibit 2.

One Illustration of Big, Inter-Sector Research: Accelerating Medicines Partnership (AMP)

The Accelerating Medicines Partnership (AMP) is a bold new venture between the NIH, 10 biopharmaceutical companies and several non-profit organizations to transform the current model for developing new diagnostics and treatments by jointly identifying and validating promising biological targets of disease.

The ultimate goal is to increase the number of new diagnostics and therapies for patients and reduce the time and cost of developing them.

Three diseases for initial focus are:

- Alzheimer's disease
- Type 2 diabetes
- Autoimmune disorders of rheumatoid arthritis and lupus

Accelerating Medicines Partnership		
Government	Industry	Non-Profit Organizations
FDA	AbbVie	Alzheimer's Association
NIH	Biogen Idec	American Diabetes Association
	Bristol-Myers Squibb	Lupus Foundation of America
	GlaxoSmithKline	Foundation for the NIH
	Johnson & Johnson	Geoffrey Beene Foundation
	Lilly	PhRMA
	Merck	Rheumatology Research Foundation
	Pfizer	USAgainstAlzheimer's
	Sanofi	
	Takeda	

<http://www.nih.gov/science/amp/index.htm>

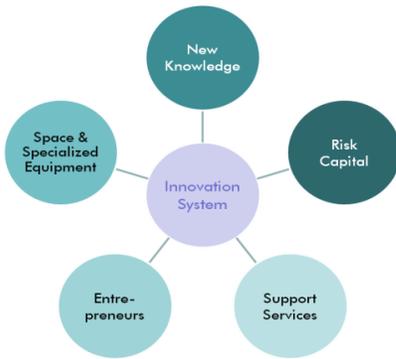
¹ <https://www.census.gov/prod/2003pubs/c2kbr-24.pdf>, page 4.

² US Census Bureau. <http://quickfacts.census.gov/qfd/states/00000.html>

On Science vs. Applied Science

“No, a thousand times no; there does not exist a category of science to which one can give the name ‘applied science.’ There are science and applications of science, bound together as the fruit to the tree which bears it.”

Louis Pasteur
Révue Scientifique, 1871



In the last decade or so, we thus witness the beginnings of much broader and deeper considerations—essentially to *define the 21st century university*. And, university roles in *innovation*, for economic and public/social impact, are becoming better articulated.

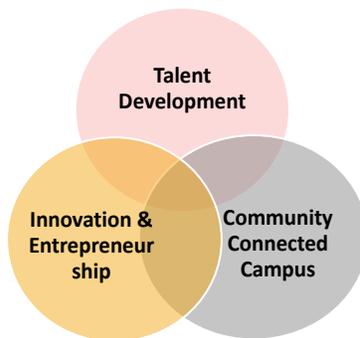
It is critical to society that our universities do not abandon basic research, and that our policy-makers commit to funding it. However, it seems inarguable that the academic research agenda now is broader than it was. We now are permanently on a course to extend *knowledge development* into applications and pragmatic problem-solving. This includes determining directions for basic research from known needs: We cannot ask only: *What problem interests me?* We also must ask: *What problems need solving for those we serve? And, what new knowledge must we pursue, in order to solve those problems?*

Concepts for 21st century university *Innovation and Engagement* strategies also are broadening beyond research and 1980s-born programs of technology transfer. Institutions are beginning to focus on integrating their strategies for *Human Capital* (always the domain of the university) with an innovation agenda that is broader than basic and applied research, and that now includes a new view of *service*—stewardship for *Quality of Place*—that is, focus on making states, regions, and urban centers competitive *places* in the *Global Knowledge Economy*. *Quality of Place* requires attention to school systems, health care delivery, community planning, transportation, environmental quality, social service systems, good government, and a host of other factors that make a place attractive to people.

Toward New Formulations of University Mission



Association of Public and Land-Grant Universities / Commission on Innovation, Competitiveness, and Economic Prosperity (CICEP)



University Economic Development Association (UEDA)

At least two national higher education associations—the Association of Public and Land-Grant Universities (APLU) and the University Economic Development Association (UEDA) are working at developing materials to help institutions consider these mission expansions and re-interpretations. Their current (draft) concepts of the functions of institutions in *economic development, engagement, and innovation* are shown in these graphics.

Finally, there is a slow change in university culture and priorities: It is no longer the case that all faculty view externally-focused functions as peripheral or entirely separate from, or even antithetical to, core mission: Increasingly, this outward focus on multiple constituencies is leading to *new versions of core mission*. There is much greater emphasis on multidisciplinary problem-solving and complex partnerships—and on designing *regional innovation eco-systems*, with university and non-university components and participants.

Overall, universities are absorbed in efforts to:

- Define their programs and services in *economic / community engagement and innovation*
- *Define niches of expertise in which to focus*—to achieve true prominence and, thereby, to enhance their impact
- *Expand faculty culture* by means of incentives and recognition for innovation activities and engaged scholarship
- *Think of place-making and impact on place* in ways that connect communities of university people with corporate, governmental, and community partners—and that energize innovation relationships.

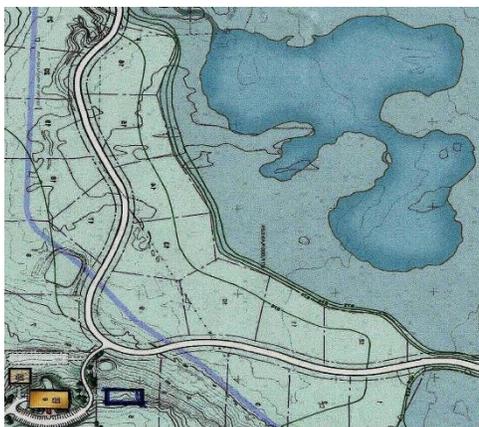
Place-Making: From Research Parks to Mixed-Use, Urbanist Innovation Campuses

As the *Global Knowledge Economy* began to emerge, early changes in the 1980s led many universities to venture into research parks, incubators, and technology transfer—all still narrowly-defined strategies for innovation, built on the model of industrial parks, and largely extramural or fairly isolated from core mission activities.

There is a very important reason why the physical model that began with industrial parks is not the correct model today. Through the mid-20th century, the *art of economic development* still was focused on creating *sites* and attracting manufacturing jobs. The idea of the suburban or rural industrial park was specifically to *segregate* industry (then still largely smoke-stack) from urban neighborhoods and civic places.

It is useful to recall that two 1950s-era parks—*Stanford Research Park* and *Research Triangle Park*—served as the models that almost all others emulated. These two clearly were products of the US’s post-World War II suburbanizing society and expanding corporate real estate interests. They were born in the *industrial park* land plan vision—the only current vision at the time for industrial sites. (In fact, *Stanford Research Park’s* initial name was *Stanford Industrial Park*.) These early parks did indeed fill up mostly with large-scale corporate R&D facilities; *that was still possible to do in the 1950s—1970s*.

Thus, the need for *21st century land design and place-making* has not always been understood among research park sponsors and their architects/planners. From the 1950s to the 1990s, most new research parks were designed on the same model as turn-of-the-20th century industrial parks. As with industrial parks, many research parks were suburban or rural sites, designed with a main loop road and with parcels defined for independent corporate facilities—resulting in loose collections of buildings, each with its own grounds and parking. (Notable exceptions were those relatively few university research parks being developed by universities in urban settings.)

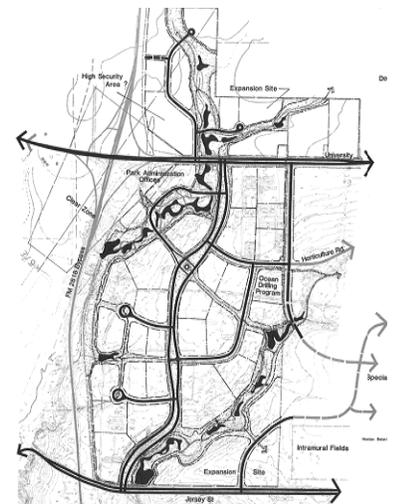


Example of an initial loop road / parcels land plan intended for large, single-user corporate facilities, and an updated plan of the same research park that includes walkable clusters of buildings, shared parking, and shared open spaces and features

By the 1990s, when it became apparent that large-scale, single corporate R&D centers were not going to fill all these research parks, the *multi-tenant facility* became a prevalent strategy—beginning with incubators, but expanding to market-rate, office / lab / flex facilities designed to accommodate users in smaller square footages. Also, having university uses in a research park initially was considered a default, even failure. Since approximately the 1990s, institutions hoping to accommodate expanding basic to applied

Re-Envisioning Research Triangle Park in North Carolina

It is completely possible to re-design research parks with existing built environments. No greater example could exist than the extensively-developed, 7,000 acre Research Triangle Park, which has a new *Master Plan* developed in 2011—the first in 50 years. RTP’s leadership is working to modernize the physical character of the place—to *densify* it and to make it a *community of innovators*, with *amenities*, and one not completely dependent on automobiles. The new RTP *Master Plan* is at <http://rtp.org/research-triangle-parks-master-plan>



Above, another loop road / parcels park plan and, below, alternate proposed concept for the same, partially developed site (several existing buildings in gray outline)



science activities and to form stronger ties to commercial R&D ventures have understood that the mix of industry, university, and community uses is exactly what makes sense.

Today, due to the changing nature of the US and global economies, we are in full reverse with respect to the idea of segregating industry: The idea now is that we must **integrate** the activities of researchers and innovators—university, government, and corporate. The entire model depends upon collaborations in the basic-to-applied knowledge continuum. Then, *place* characteristics must follow the mixed-user program mission—a **university-centric knowledge community**. A more integrated approach to physical environments is emerging—where a very high value is placed on the principle that the physical environment must support a *knowledge community*. **Put another way, EKA believes that the correct physical model is more like a campus than like an industrial park.**

Architecturally, contemporary research place designs are more open and dynamic with a focus on connecting diverse people, programs and disciplines. New models for *research communities* include more than office / lab buildings. Increasingly, they include housing, retail, food, and other amenities, and open or passive recreation space—in pedestrian-friendly environments.

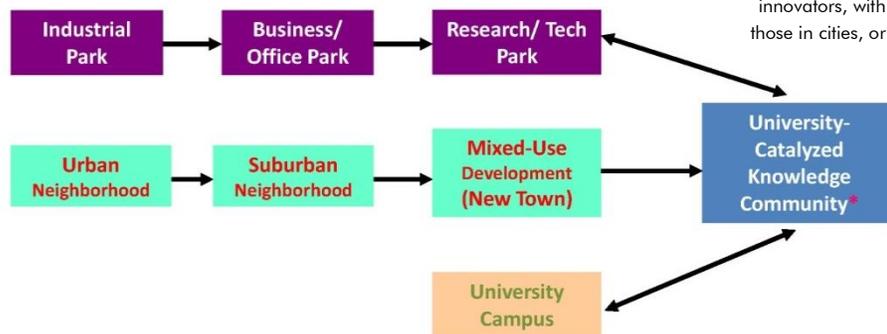


Image courtesy of Ayers Saint Gross

The early idea = segregate industry (manufacturing) from neighborhoods in ex-urban industrial parks

Manufacturing declines; business becomes “cleaner” and R&D is a focus. Thus, Industrial Parks morph into Business Parks and Research Parks

The new idea = integrate university, business, industry, and government R&D in an innovation campus—a community of innovators, with amenities like those in cities, or like a campus.



Live, work, and play in a university-centered (urbanist) community setting.

Consultants’ Observations

Given observable national trends, NDSU’s present initiative to develop its strategies / agenda for *Research and Innovation* is a timely undertaking. It fits completely with a large flurry of strategic activity at other universities nation-wide.

This Assessment is rooted in EKA’s planning experience and thought leadership of the last 25 years, including service on the Boards of the Association of University Research Parks, International Economic Development Council, and University Economic Development Association. To define university roles in economic development, we know that early ideas about real estate (parks) and technology transfer (licensing) were much too narrow. National associations are leading dialogue about a much broader view—one that takes in preparation of the *knowledge workforce and entrepreneurs*; a range of *partnership models for advancing innovation*; impact on *quality of place / communities*, and creation of *innovation campuses*. Phase 2 should begin with discussing and adopting an NDSU **definition of innovation**—and one that is informed by newest ideas emerging nationally.

3—CONTEXT: THE STATE OF NORTH DAKOTA

North Dakota became a state in 1889. Of the 50 states, it is 17th in land area (square miles) and it is 48th in population. It is one of the only states not currently experiencing economic distress and, in fact, currently leads the US in GDP growth. It is a state that prides itself on investments in people / education, information technology, and transportation infrastructure for economic development.

Population and Educational Attainment

The population is just under 700,000 (2012 census). Of those, about 100,000 are in Fargo. We understand that population peaked in the 1930s and then declined for several decades. Recently, the past pattern of out-migration has been reversed. However, the combination of strong economic growth with small population means that there is a persistent *knowledge workforce* shortage, especially those with STEM knowledge/skills.

As of 2011 data, the State ranks 10th among the 50 states in educational attainment of its population. At 44.7 percent of working age adults with associate degrees or higher, it is 6.1 percent behind the *best-educated state*—Massachusetts—which is at 50.8 percent, and it is well ahead of the national average, at 38.7 percent.

Current and Target Industries

Agriculture traditionally has been the main economic engine of North Dakota and the State is a world leader in many crops. Animal products are a smaller but also vital sector.

North Dakota is experiencing a high level of economic activity in the Energy/Natural Resources sector, now contributing economic activity and wealth, alongside the State’s traditional strengths in Agriculture and Manufacturing.

Health Care, Financial Services, Real Estate, and Tourism also are significant industries.

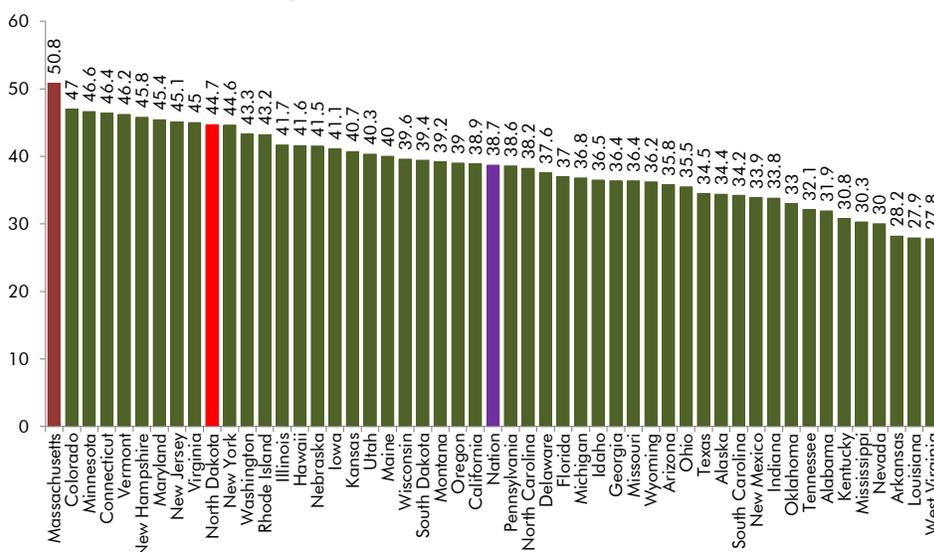
Government, which includes public education and higher education, is a major element in the state economy.

The State’s economic development plan identifies its *Target Industries* as:

- Advanced Manufacturing
- Value-Added Agriculture
- Energy
- Technology-Based Business
- Tourism
- Unmanned Aerospace Systems

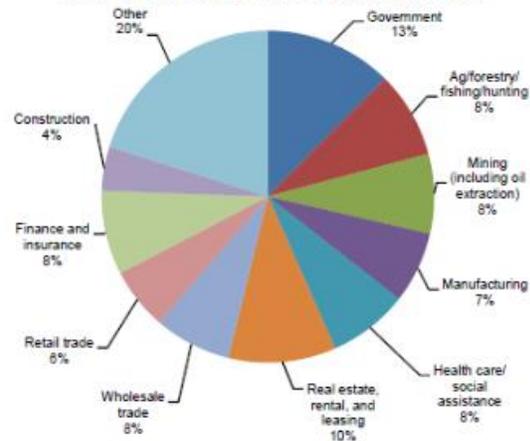


Percent of 25-64 Year Olds with College Degrees – Associate and Higher, 2011



Source: 2011 American Community Survey, US Census Bureau

2011 Gross State Product by Major Industry



Strategic Plan for Economic Development

The *Strategic Plan for Economic Development* was produced by the ND Economic Development Foundation, advisory to the Legislature.³ It focuses on five growth strategies:

1. Maintain a positive business climate—for private sector investment, growth, job creation
2. Continue investing in university-based research and development conducted with the private sector that engages ND in emerging industries such as life sciences and advanced technology
3. Embrace entrepreneurship and foster a culture of entrepreneurship where innovative, tech-savvy companies can thrive
4. Continue investing in statewide talent strategies that address education, training recruitment and retention to provide a steady supply of skilled workers needed to fuel long-term business growth
5. Promote export trade by linking ND businesses with foreign buyers and markets.

The Department of Commerce is the State's lead agency for economic development programs, services, and investments. It has four divisions: Tourism, Economic Development, Workforce Development and Community Services.

North Dakota has a clear branding message for business recruitment—*10 Reasons to Invest and Do Business in North Dakota*.

10 REASONS TO INVEST AND DO BUSINESS IN



1. North Dakota was named the best run state in the nation for the 2nd year in a row. *24/7 Wall Street, 2013*
2. *Gallup Job Creation Index* ranks North Dakota #1 for the Best Jobs Market in 2013.
3. North Dakota ranks #1 in the nation for the highest growth of GDP in 2010, 2011, and 2012. *Bureau of Economic Analysis, 2012, 2013*
4. *Business Facilities* ranks North Dakota #1 for economic growth potential in 2013.
5. North Dakota was named the nation's #1 top overall growth performer since 2000. *U.S. Chamber of Commerce, 2013*
6. North Dakota has a Standard & Poor's top credit ranking of 'AAA.'
7. *Forbes Magazine's 2013 Best States for Business and Careers* recognizes North Dakota as the #2 state for business. North Dakota ranks #3 as a pro-business state in America, according to the *Polina Corporate Top 10 Pro-Business States for 2013*.
8. North Dakota ranks #2 in the nation in state competitiveness and ranks #2 in a national entrepreneurship index. *Beacon Hill Competitiveness Index, 2012*
University of Nebraska, Bureau of Business Research, 2012
9. North Dakota residents and businesses have received over \$2.4 billion in cuts to individual and corporate income and property taxes, from the 2009, 2011 and 2013 legislative sessions. *North Dakota Tax Commissioner*
10. North Dakota has increased exports by 585 percent since 2000. *U.S. Department of Commerce, 2012*




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Updated April 2014

³ *North Dakota Economic Development, Strategic Plan 2010-2020*, Covenant Consulting Group, 2010

Innovation Investment Programs

Centers of Excellence Program

Proposed by Governor John Hoeven and passed by the Legislature in 2005, North Dakota launched the Centers of Excellence program to support growth and innovation among North Dakota businesses and industries.

Twenty centers for targeted research and workforce training have been created under this Program, generating \$329.4 MM in economic impact and creating 2,060 total jobs and 17 new or expanded businesses. The NDCOE program is built on the concept of partnering the research capacities found in ND public colleges and universities with private-sector companies, to generate jobs and new business opportunities.

The Program is overseen by the Centers of Excellence Commission which is comprised of members appointed from the State Board of Higher Education and the Economic Development Foundation.

Research North Dakota Program

Governor Dalrymple recently reconfigured North Dakota's innovation investments into a program called *Research North Dakota*. Recently, the Legislature approved \$12 MM for these various research / technology / innovation investments:

- \$2 MM to support commercialization of intellectual property developed at North Dakota's research universities through spinoffs or startup companies locating in state
- \$4 MM to fund research projects to commercialize treatments for cancer and other virally infectious diseases
- \$6 MM to fund research development and commercialization activities related to private-sector businesses across all industry sectors.

The following information, describing the programs under *Research ND*, is from the *Research ND* web page:⁴

Research ND stimulates partnerships between North Dakota research universities and private sector businesses. Research ND funds may be used for:

- *Commercialization of new technologies*
- *Research and development of new products*
- *Improvement of existing products or processes*

Research ND BIO is a sub-program of Research ND, limited to the development and commercialization of vaccines and antibodies for the prevention of, treatment of, or cure for cancer; virally infectious disease; or other pathogens, including bacteria, mycobacteria, fungi, and parasites.

Fast Track incentivizes companies to reach out to North Dakota research universities when dealing with unforeseen circumstances or when working on time-sensitive projects. Fast Track funds may be used for projects that have:

- *A project duration of less than 1 year;*
- *A compelling reason to start immediately; and*
- *A private sector partner with a substantial presence in ND or an active collaboration with an ND manufacturer.*

⁴ <http://www.commerce.nd.gov/research/VentureGrants/>

The Venture Grant Program is designed to help move university-developed technology into the marketplace through startup or spinout companies. The Venture Grant Program provides seed grants and matching funds to facilitate startup and spinout companies' use of university technology. Phase I Venture Grants are intended to determine the feasibility of building a business around university technology. Acceptable uses include:

- *Analysis of the potential market*
- *Assessment of the technologies' readiness*
- *Further advancement of technology*
- *Intellectual property costs.*

Phase II Venture Grant applications will only be accepted from individuals/groups that have successfully completed a Phase I award. Phase II provides matching funds to the research university to continue refining the technology for market. The research university's identified private sector partner may be:

- *An early stage company; or*
- *An individual interested in starting a business using university technology.*

Innovate ND

The North Dakota Department of Commerce announced the launch of the new *Innovate ND* program for entrepreneurs. *Innovate ND* is an enrollment program; the cost is \$250 to access up to \$2,500 in resources. The expanded program focuses on fostering innovation and accelerating venture formation/growth in North Dakota.⁵

Since 2006, Innovate ND has served 450 entrepreneurs, startups, and early-stage ventures by providing comprehensive educational program and coaching through entrepreneurial centers to help entrepreneurs build new ventures. New Innovate ND features include:

- ***Innovate ND Vouchers.** When signing up with Innovate ND each participant initially receives up to \$2,500 that can be used to advance their business. The \$2,500 voucher may be used for coaching and consulting services at an entrepreneurial center, creating a business plan or developing a prototype. Additional vouchers are available for businesses who meet established criteria.*
- ***Educational Services.** Innovate ND will offer multiple educational services to build a strong foundation for entrepreneurs to start their venture. Entrepreneur Boot Camps will be held in the spring and fall of each year and an online class is available upon sign up for Innovate ND. The educational services address key topics and Innovate ND participants can attend at any stage in their business development. The educational content is valued at over \$2,200.*
- ***Online Resources.** The new Innovate ND website will serve as a resource to entrepreneurs looking to start or expand their business. Visitors will have access to new content and an online forum to help build their entrepreneurial resources and contacts.*
- ***Business Competitions.** Innovate ND will hold an annual competition in the spring of each year. There will be two categories for participants to compete; an Idea competition and a Venture Competition. The Idea Competition will provide an opportunity for startups to compete based on their business idea. This will also serve as a starting point for Innovate ND participants to gain feedback for their idea and serve as a launch pad to take their idea to the next level. Innovate ND will also hold a Venture Competition targeted toward businesses that are ready for venture capital or at an advanced stage.*



North Dakota's Entrepreneurial Centers

UND Center for Innovation
Foundation, Grand Forks,
www.innovators.net

NDSU Research & Technology Park,
Fargo, www.ndsuresearchpark.com

I.D.E.A. Center, Bismarck,
www.ideacenternd.org

Strom Center for Entrepreneurship &
Innovation, Dickinson,
www.stromcenter.com

MiSU Severson Entrepreneurship
Academy, Minot,
http://www.minotstateu.edu/business/ent_academy.shtml

⁵ Text copied from *New Innovate ND Program Launched*, ND Commerce, posted on 1/15/2014

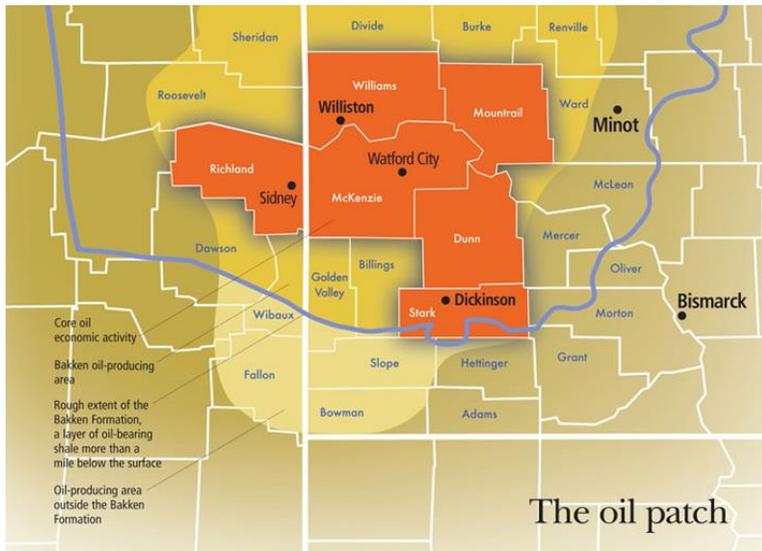
Technology-Based Entrepreneurship Grants

The *Technology-Based Entrepreneurship Grant Program* provides funds to entrepreneurial centers to aid the growth of tech-based business in North Dakota. Entrepreneurial centers provide business incubator services such as mentors, marketing assistance, accounting / financial management, training and more to individuals working to develop their business ideas. The program provides grants for programs and projects.

- **Program grants** enable entrepreneurial centers to provide assistance to multiple technology-based entrepreneurs.
- **Project grants** to tech entrepreneurs assist business efforts in four ways: Access to Capital; Marketing Assistance; Entrepreneur Infrastructure; and Entrepreneurial Talent.

The Bakken Region

The Resource



Sidney
The center of oil activity and home construction in Montana's portion of the Bakken

Williston
The hub of the region's petroleum industry, home to 200-odd oilfield service firms

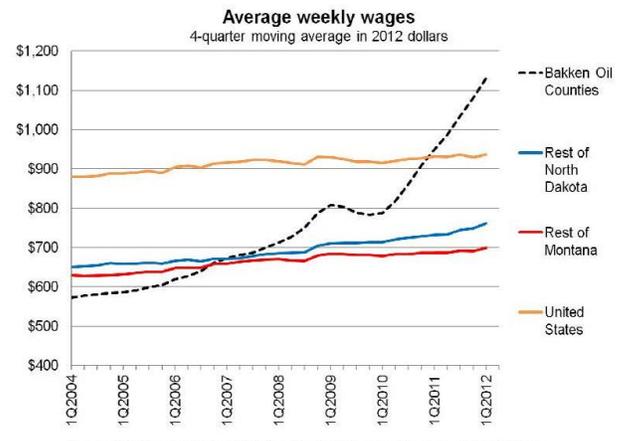
Watford City
Community has annexed land and extended sewer lines to accommodate a burgeoning population

Dickinson
A farming, manufacturing and university community developing into an oilfield service center

Minot
A gateway to the oil patch for oil companies, construction firms and other businesses doing business in the oilfields

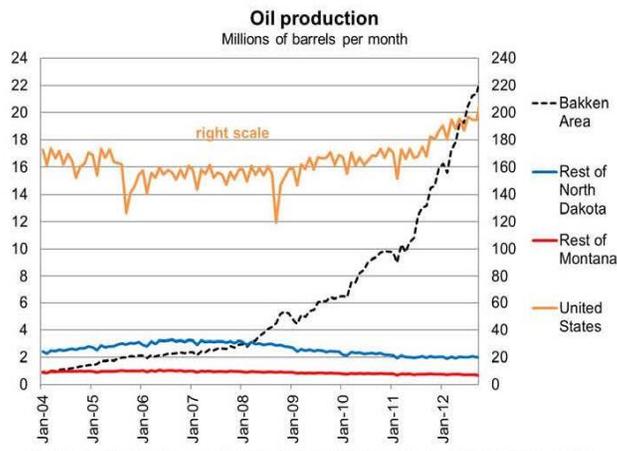
Bismarck
State capital becoming a bedroom community for oil and construction industry managers and their families

This is the region of Western North Dakota (and into eastern Montana) that is being exploited actively for its oil/gas deposits. According to the North Dakota Department of Mineral Resources, North Dakota production is from Bakken, Sanish, Three Forks and Bakken/Three Forks Pools. North Dakota counties involved are Billings, Burke, Divide, Dunn, Golden Valley, McKenzie, Mountrail, Stark, and Williams.⁶ Deposits apparently are significant and resources may be extracted for some time to come.



Source: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Highlights of Recent Trends
Data on Demographic, Economic and Financial Activity in the Bakken.
December 20, 2012. Federal Reserve Bank of Minneapolis



Source: U.S. Energy Information Administration, North Dakota Department of Mineral Resources, Montana Board of Oil and Gas Conservation

Manufacturing in / for the Bakken Oilfields

The web page of NDSU's Department of Industrial and Manufacturing Engineering (IME) points out that it is not only extraction that is generating economic activity; there also is growth in manufacturing. The following is from that web page.⁷

The Bakken is rocking, and so is its manufacturing base! North Dakota boasts a strong metal manufacturing base heavily rooted in production of equipment and components for the ag industry. As the growth in the Williston Basin oilfields has presented opportunity, regional manufacturers have started tooling up to support the oil and gas industry. You can find North Dakota manufacturers making items such as:

- Frac Tanks
- Oilfield Storage Tanks
- Shale Catch Tanks
- Pipe Racks
- Flow-back Tanks
- Containment systems
- Flares
- Service Rigs
- Drilling Rigs
- Heat Treaters
- Industrial Heaters
- Filtration Systems

As IME has identified, this means extensive opportunities for NDSU engineering (and perhaps other disciplines) to engage with new and expanding manufacturing activity.

⁶ North Dakota Department of Mineral Resources, cited by the Federal Reserve Bank of Minneapolis, at http://www.minneapolisfed.org/publications_papers/fedgazette/oil/index.cfm?&TC=1&DPR=1

⁷ <http://www.ag.ndsu.edu/manufacturing/manufacturing-in-the-bakken-oilfield-region>

The Legacy Fund

North Dakota first proposed the Legacy Fund in 2008 and legislators approved its creation in 2010. Established by constitutional amendment, the Fund will receive 30 percent of annual oil extraction and production taxes. Spending is restricted through 2017. Then, spending must be approved by a two-thirds vote of the Legislature, and no more than 15 percent of the Fund can be spent in any two year budget cycle.

The Fund is now at \$1.BB and is expected to surpass \$3BB by the time lawmakers determine best use of the funds.⁸

North Dakota’s Conservative Culture

To the extent that the State’s culture is a factor in planning *Research and Innovation* strategies for NDSU, EKA found the interview comments revealing: The State’s culture is said to be risk-averse and conservative. Small size of the population is seen also as both a negative and a positive. (See interview comments in Section 10).

Trust in State Government

As this report was being finished, the Gallup organization released its newest poll on opinions of state government. From the webpage:

The results are based on a special 50-state Gallup poll conducted June-December 2013, including interviews with at least 600 residents in every state. This poll allows Gallup for the first time to report trust in state government at the state level. Gallup has previously measured Americans' trust in their state governments on a national basis. The most recent national estimate, from September 2013, finds 62% of all Americans having a great deal or fair amount of trust in their state government.

It turns out that North Dakota was at the top of the list—the state with the most trusted state government, with 77 percent of the respondents having a “great deal” or “fair amount” of trust in state government. The all-US average was 58 percent.

States With Highest Trust in State Gov't

	% Great deal/ Fair amount of trust
North Dakota	77
Wyoming	76
Utah	75
South Dakota	74
Nebraska	73
Texas	72
Alaska	71

Gallup 50-state poll, June-December 2013

States With Lowest Trust in State Gov't

	% Great deal/ Fair amount of trust
Illinois	28
Rhode Island	40
Maine	40
Pennsylvania	46
Louisiana	48
California	49
Maryland	49

Gallup 50-state poll, June-December 2013

⁸ <http://bakkenshale.com/news/bakken-oil-revenue-push-north-dakotas-legacy-fund-3-billion/> and <http://www.swfinstitute.org/swfs/north-dakota-legacy-fund/>

Consultants' Observations

Overall, North Dakota ranks high (10th) in overall education attainment among working age adults—an excellent marketing strength for the State.

Small population is not an economic strength in the *Knowledge Economy*, but oil / gas production and the University are positive contemporary factors in attracting smart people to the State; retention rates among educated people are good, and the out-migration problem is being reversed. Small population does have one distinct advantage—one can more easily get statewide consensus on policy.

Oil / gas production in the Bakken Region is driving very significant new opportunities (wealth) and creating some challenges (strained communities) in Western North Dakota.

Innovation investments often are high-risk. Certainly, many new businesses or products fail; some rate of failure is to be expected as part of any innovation strategy, and must be tolerated. While the traditional cautious culture of the State's people may present a challenge for policy-makers and for voters (i.e., the general population), it appears to EKA, as observers, that North Dakota's elected policy-makers are meeting this challenge.

The State has clearly articulated growth strategies, among which are, since 2003, several special programs by which to invest in the continuum from research to innovation. On this latter point, it should be noted that many states have been making such research/innovation investments for several decades. Ohio's Third Frontier, Pennsylvania's Ben Franklin Partnerships, and North Carolina's Biotechnology Center are but three examples of state innovation investments that date from the 1980s and continue today. There is, thus, some catching up required—with those states that have had a longer investment cycle in research and innovation—a challenge that time will solve.

4—CONTEXT: NORTH DAKOTA PUBLIC HIGHER EDUCATION

As part of the state framework, the governance and funding structures for higher education also form a context for NDSU's future *Research and Innovation* strategies.

Governance

North Dakota University System

North Dakota higher education was organized as a unified system in 1990. The North Dakota University System (NDUS) includes two research universities—UND and NDSU, four regional universities and five community colleges. The Chancellor of the System is supported in oversight of planning and policy by approximately 40 senior, mid-level, and support staff.⁹ There is a requirement that both the institutions and the System prepare an updated strategic plan every six years.

Collectively, the System employs more than 11,000 workers, educates about 48,000 headcount students, and generates expenditures supporting more than 11,000 secondary jobs. The System represents \$1.6BB in student and NDUS expenditures and the most recent economic impact study (2011) indicates that the System generates about \$4.4BB in economic activity for North Dakota.

State Board of Higher Education

The State Board of Higher Education (SBHE) is the policy-setting, governing, and advocacy body for the NDUS (and North Dakota's 11 institutions). The SBHE also oversees the NDSU Extension Service and Agricultural Research Stations, Northern Crops Institute, State Forest Service and the Upper Great Plains Transportation Institute.

The SBHE consists of seven citizen members appointed to four-year terms by the governor and one student appointed by the governor to serve a one-year term. The Council of College Faculties selects the Board's non-voting faculty advisor, and the NDUS Staff Senate selects the Board's non-voting staff advisor.¹⁰

Forthcoming Voter Referendum

House Concurrent Resolution 3047 puts on the 2014 general election ballot the option of creating a three-member Commission of Higher Education, which would consist of full-time employees, replacing the part-time SBHE and the chancellor position.

Measure 3 repeals and replaces Section 6 of Article VII of the Constitution of North Dakota with a new section. The new section reads:[1]

- 1. A three-member commission of higher education is created for the purpose of overseeing and administering the provision of public higher education at sites that include Bismarck, Bottineau, Devils Lake, Dickinson, Fargo, Grand Forks, Mayville, Minot, Valley City, Wahpeton, and Williston.*
 - 2. The governor shall appoint each member of the commission from a list of at least three nominees agreed to by a majority of the following:
 - a. The speaker of the house of representatives;*
 - b. The president pro tempore of the senate;*
 - c. The chief justice of the North Dakota supreme court;*
 - d. The superintendent of public instruction; and*
 - e. A representative of an educational interest group selected by three of the four aforementioned individuals.**
- 3. The governor shall ensure that one member of the commission has leadership experience in a private sector business, industry, or service, and that one member, at the time of appointment, holds a professional position within the higher education sector. Each member of the commission must be confirmed by the senate.*
 - 4. The term of office for each commission member is four years, except that the initial terms must be staggered by lot so that no more than one member's term expires each year. Each term begins on July first and members may be reappointed to three consecutive terms.*
 - 5. A member of the commission is subject to removal by impeachment in the same manner as that established for the removal of the governor.*
 - 6. a. The commission has full executive responsibility for the management and operation of the North Dakota university system, within constitutional and statutory requirements and limitations.
 - b. The commission shall hire a president for each institution within the system and each president shall report to the commission.**
 - 7. The legislative assembly may provide for the appointment of an advisory board that includes a faculty and a student representative.*

http://ballotpedia.org/North_Dakota_Commission_of_Higher_Education_Amendment,_Measure_3_%282014%29

⁹ Full documentation of NDUS policies is found at <http://www.ndus.edu/makers/procedures/sbhe/>

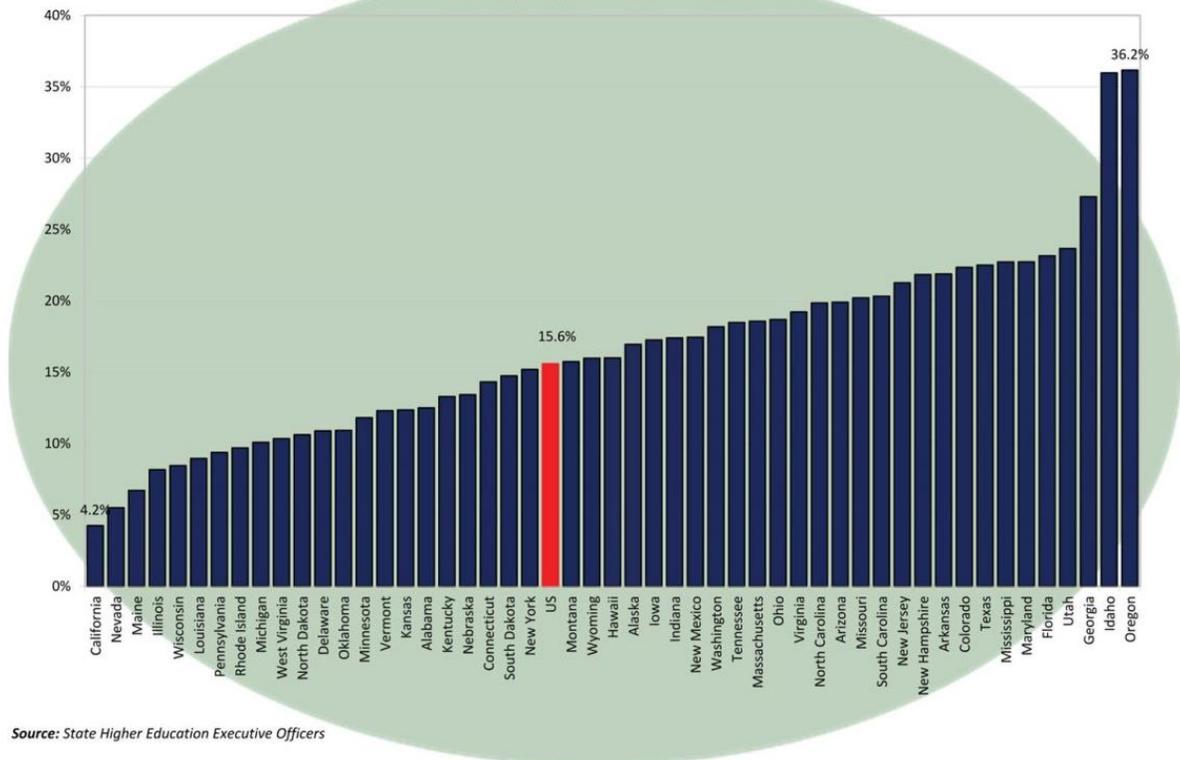
¹⁰ <http://www.ndus.edu/board/>

Recent and Projected Enrollment Growth

Recent Growth Trend

According to the State Higher Education Executive Officers (SHEEO), full-time equivalent enrollment (FTE) grew substantially in the US, from 2007 through 2012, ranging from 4.2 percent for California to 36.2 percent for Oregon. The US average growth in enrollments was 15.6 percent. North Dakota’s FTE enrollment growth for this recent period was at the lower end of the range, about 10 percent.

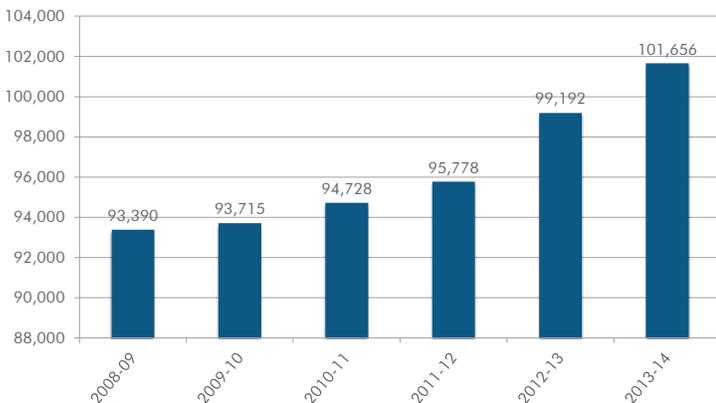
**Full-Time Equivalent (FTE) Enrollment in Public Higher Education
Percent Change by State, Fiscal 2007-2012**



Source: State Higher Education Executive Officers

Likely Accelerating Growth in Demand

North Dakota: K-12 Public School Enrollment Growth: 2009 to 2014



Source: <http://www.dpi.state.nd.us/resource/directry/index.shtm>

Higher education leaders interviewed pointed out that, along with the Bakken oil / gas boom and tech firm growth, there is noticeable growth in the State’s K-12 enrollments. This is beginning to have an impact in rising demand for postsecondary education in the State.

In our interviews, no one voiced any opinions to the effect that this growth is likely to stop or reverse.

Funding

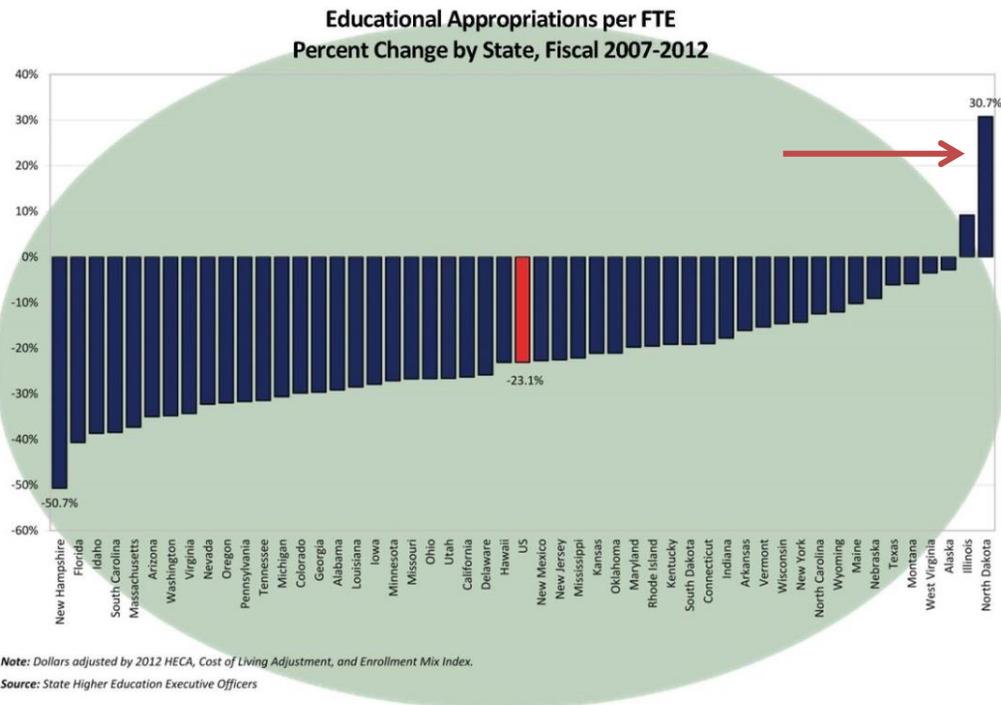
Recent Trend

It is clear that a tide has turned in North Dakota.

In the recent past (2007 to 2012), North Dakota has *significantly increased* per FTE public funding to higher education, *decisively surpassing all other states in positive funding changes.*

As the graphic shows, per FTE funding in North Dakota is up nearly 31 percent for the five-year period, whereas the US average *decreased* by 23 percent in the same period—a *differential of 54 percent.* (Only Illinois also had increasing funding during this same period—and its increase was much smaller than North Dakota’s.)¹¹

Over time, if it is sustained, this serious change in investment level will help the State catch up with (and possibly surpass) other states in terms of building long-term institutional faculty strengths and quality of program outcomes.



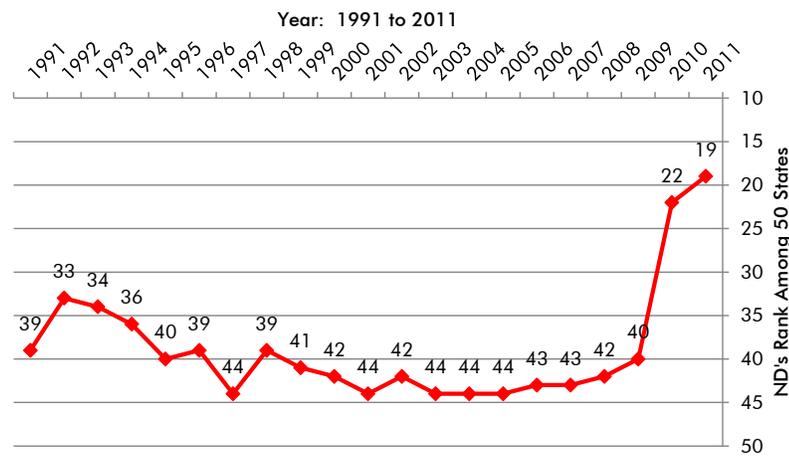
Strong Reversal of Earlier Non-Competitive Funding

Certainly, many interviewees for our study commented that North Dakota institutions had been chronically under-funded vis-à-vis peers in other states.

Based on data from the National Center for Higher Education Management Systems (NCHEMS), during the 1990s and 2000s, the State’s rank was, indeed, in the bottom 10 to bottom third, generally falling in the low 40s in rank.¹²

More recently, however, NCHEMS data show that North Dakota was ranked 22 and 19 in 2010 and 2011 respectively, in public support per FTE student.

State/Local Public Higher Education Support per FTE Student: North Dakota's National Rank—Two-Decade Trend



¹¹ Graphic from *State Higher Education Finance: FY2012*, State Higher Education Executive Officers (SHEEO), page 34.

¹² National Center for Higher Education Management Statistics (NCHEMS), [http://www.higheredinfo.org/stateprofile/index.php?state=38&years\[\]=2011&years\[\]=2010&years\[\]=2009&years\[\]=2008&years\[\]=2007&years\[\]=2006&years\[\]=2005&years\[\]=2004&years\[\]=2003&years\[\]=2002&years\[\]=2001&years\[\]=2000&years\[\]=1999&years\[\]=1998&years\[\]=1997&years\[\]=1996&years\[\]=1995&years\[\]=1994&years\[\]=1993&years\[\]=1992&years\[\]=1991](http://www.higheredinfo.org/stateprofile/index.php?state=38&years[]=2011&years[]=2010&years[]=2009&years[]=2008&years[]=2007&years[]=2006&years[]=2005&years[]=2004&years[]=2003&years[]=2002&years[]=2001&years[]=2000&years[]=1999&years[]=1998&years[]=1997&years[]=1996&years[]=1995&years[]=1994&years[]=1993&years[]=1992&years[]=1991)

Data for 2012, from a different source (SHEEO), shows an even higher North Dakota rank in per FTE funding—11th in appropriations per FTE and 10th in total educational revenues per FTE.

National per FTE Funding Comparison: 2012

Total Educational Revenues Per FTE and Educational Appropriations per FTE

Total Educational Revenues Per FTE*		Educational Appropriations (State/Local) Per FTE*	
1 Delaware	\$16,913	1 Wyoming	\$14,105
2 Alaska	\$16,454	2 Alaska	\$11,909
3 Wyoming	\$16,359	3 North Carolina	\$8,735
4 Rhode Island	\$15,231	4 Illinois	\$8,554
5 Maine	\$14,097	5 Texas	\$7,938
6 Vermont	\$14,023	6 New York	\$7,542
7 Connecticut	\$14,016	7 New Mexico	\$7,430
8 Maryland	\$13,924	8 Connecticut	\$7,354
9 Alabama	\$13,785	9 Oklahoma	\$7,008
10 North Dakota	\$13,585	10 Kentucky	\$6,959
11 New Jersey	\$13,322	11 North Dakota	\$6,938
12 Michigan	\$13,148	12 Nebraska	\$6,933
13 Kentucky	\$12,886	13 Hawaii	\$6,898
14 Pennsylvania	\$12,865	14 Arkansas	\$6,873
15 Illinois	\$12,855	15 Nevada	\$6,676
16 Texas	\$12,678	16 Maryland	\$6,668
17 North Carolina	\$12,217	17 Georgia	\$6,644
18 Minnesota	\$12,196	18 California	\$6,577
19 Virginia	\$11,975	19 Maine	\$6,071
20 Oklahoma	\$11,861	20 New Jersey	\$6,051
21 New York	\$11,852	21 Mississippi	\$6,033
22 South Carolina	\$11,551	22 Alabama	\$5,855
23 Mississippi	\$11,464	23 Idaho	\$5,661
24 Iowa	\$11,449	24 Wisconsin	\$5,639
25 Nebraska	\$11,410	25 Tennessee	\$5,582
26 West Virginia	\$10,950	26 West Virginia	\$5,575
27 South Dakota	\$10,699	27 Louisiana	\$5,551
28 Georgia	\$10,501	28 Rhode Island	\$5,226
29 Hawaii	\$10,446	29 Florida	\$5,130
30 Nevada	\$10,430	30 Missouri	\$4,984
31 Indiana	\$10,396	31 Utah	\$4,830
32 Wisconsin	\$10,371	32 Washington	\$4,788
33 Tennessee	\$10,305	33 Massachusetts	\$4,712
34 Massachusetts	\$10,238	34 Delaware	\$4,663
35 New Hampshire	\$10,189	35 Kansas	\$4,647
36 Oregon	\$9,985	36 Minnesota	\$4,607
37 Missouri	\$9,870	37 Arizona	\$4,567
38 Ohio	\$9,706	38 South Carolina	\$4,515
39 New Mexico	\$9,623	39 Iowa	\$4,390
40 Arkansas	\$9,600	40 Virginia	\$4,272
41 Arizona	\$9,375	41 Indiana	\$4,258
42 Kansas	\$9,313	42 South Dakota	\$4,195
43 Utah	\$9,165	43 Michigan	\$4,185
44 Louisiana	\$9,138	44 Montana	\$4,007
45 Idaho	\$8,990	45 Pennsylvania	\$3,875
46 California	\$8,842	46 Oregon	\$3,851
47 Montana	\$8,841	47 Ohio	\$3,663
48 Colorado	\$8,722	48 Colorado	\$2,551
49 Washington	\$8,215	49 Vermont	\$2,512
50 Florida	\$8,213	50 New Hampshire	\$1,583

Source: NDUS Financial Review, FY2013, data from FY2013 SHEEO State Higher Education Finance Report

This is a hugely positive state policy change.

The currently very competitive level of investments now will begin to reverse the cumulative effects of earlier non-competitive capacity-building, based on the trend of the 1990s and 2000s—perhaps longer.

New Funding Formula

Also extremely positive is the State’s recent decision to change the funding formula for allocation of funds to institutions based on factors that drive cost differences.¹³ Under SB2200, North Dakota’s new formula, as we understand it, will:

- Link base funding with students’ rate of completing courses with passing grades
- Provide funding per credit hour earned by students based on cost factors that vary with disciplines (based on the standard *Classification of Instructional Programs* or *CIP*). The factors will range from 1.0 for lowest-cost disciplines to 38.0 for Medical School courses.
- Funding also will be differentiated for lower division, upper division, graduate and professional credit hours. This helps the senior institutions and the research universities, with the more costly upper levels of instruction.

This new formula now is consistent with practices in many other states, which have, for some time, provided higher funding levels per credit hour for upper division and graduate instruction, and which also have had differential funding levels by discipline groups.

As with the overall higher funding levels, this new formula is a very positive new development—a clear indication that the Governor and Legislature are willing to invest in higher education. As they should, they will expect these investments to bear fruit for the State.

¹³ <http://legiscan.com/ND/bill/2200/2013>

Consultants' Observations

There is an interesting juxtaposition between the State's overall educational attainment statistics—which are strong (ND's rank = 10 of 50 states) and the State's history (until recently) of relatively low investments in higher education. Small population may be a factor. Also, there may be a history of out-migration of students who earned degrees at universities in other states.

In general, the State lagged most other states, for some time, in funding per FTE. Now, the State is investing more in higher education, relative to many other states—a fact which should prove to be a structural economic advantage over time. Also, the new funding formula is a very positive policy change.

Demand for higher education may continue to increase, as the State's population and K-12 enrollments increase.

Some additional information specifically about NDSU's resources per FTE student is provided in Section 6.

5—CONTEXT: FARGO AND THE RED RIVER VALLEY REGION

Fargo-Moorhead MSA

Fargo is the county seat of Cass County. The County’s population is about 163,000 and it has grown 21 percent from 2000 to 2010. With its twin city, Moorhead, MN, the Metropolitan Statistical Area (MSA) has a population of 216,000. Fargo–Moorhead is the cultural, retail, health care, educational, and industrial center of southeastern North Dakota and northwestern Minnesota.

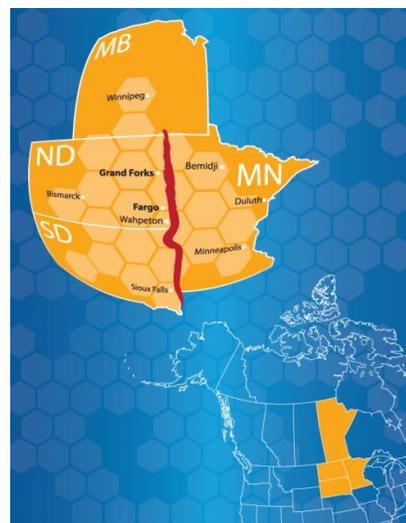


Minnesota Service Area of NDSU

While land-grant universities most typically serve their states, the proximity of NDSU to Minnesota is such that there are 18 counties of Minnesota—within a 100-mile radius of Fargo, that are considered part of NDSU’s formal service area. These counties are: Becker, Beltrami, Clay, Clearwater, Douglas, Grant, Hubbard, Mahnomon, Marshall, Norman, Otter Tail, Pennington, Polk, Red Lake, Stevens, Traverse, Wadena, and Wilkin.

The Red River Valley Region

The *Red River Valley* designates a region in eastern North Dakota that comprises the north-south corridor along the Red River Valley from South Dakota to the Canadian border. It is roughly anchored by the communities of Wahpeton-Breckenridge and Fargo-Moorhead in the south, and by Grand Forks-East Grand Forks in the north. As such, it includes the greatest concentration of population and economic activity in the State.



The Valley also represents the tangible connection to Minnesota, where many economic and academic resources important to the region also are located. Minnesota is an important source of workforce, and provides significant student enrollment in North Dakota’s universities and community colleges.

While scenic, the Valley also is notable for its history of floods—some of which have been near-catastrophic for the affected communities. Unique topographic, climatic, and other natural features of the surrounding region—including the northward flow of the river towards Canada, where spring thaws occur later—pose special flood control challenges and make this issue a high priority for the region’s economic development agenda. Flood control is thus a defining factor in setting infrastructure investment priorities; it also forms a special body of expertise and research focus at NDSU.

Red River Valley Research Corridor

The Red River Valley Research Corridor is a non-profit corporation committed to catalyzing and promoting science, technology and engineering initiatives that create new opportunities in the region. It was established in 2002 by US Senator Byron Dorgan in an effort to attract greater levels of research dollars to the State by creating a unified platform to represent the State’s research universities and their respective communities.¹⁴ North Dakota State University, University of North Dakota, and North Dakota State College of Science are among Corridor members and the vice presidents for research of the two research institutions are members of its Board of Directors. The Corridor entity helps to document and promote the technology and research assets of the region, including corporate, academic, research parks, incubators and related workforce and entrepreneurial resources.



¹⁴ Wikipedia, http://en.wikipedia.org/wiki/Red_River_Valley_Research_Corridor

One long-time participant in its activities characterized the Corridor as having been a *strong convening entity* in the past. The Corridor organization played a key role as conduit for several hundred millions in federal research grants and contracts that came to the region's academic institutions and companies. We are told that its activities still focus on convening, including summits that address the region's economic development and technology priorities, such as STEM, Unmanned Aerial Vehicles, Precision Agriculture and Small Business.

Additionally, the Corridor organization is pro-active in monitoring federal agencies and research funding opportunities they may provide, publicizing these and encouraging applications and proposals from the region.

While its role today is described by some stakeholders as being *marketing oriented*, it is recognized as part of the region's long-time fabric for promoting coordinated efforts across and among diverse economic development, academic and governmental institutions that share a common interest in advancing a technology research and innovation agenda.

Valley Prosperity Partnership—New Regional Economic Development Plan

The Valley Prosperity Partnership (VPP) was created by regional business leaders during 2012-13 to identify common strategic economic development opportunities throughout the Red River Valley. VPP is "comprised of economic developers, colleges and universities, private sector businesses, community leaders, and others who recognize the importance of collaboration and leveraging resources. [It] is working to bring all communities in the Valley together to develop a unified, shared vision for high value and sustained economic growth for all its residents by:

- Advocating the Valley's interests and concerns to state and federal elected officials
- Leveraging and promoting existing resources
- Creating new programs and resources that address gaps or limitations
- Strengthening public and private sector partnerships and communication
- Building upon the accomplishments of the Red River Valley Research Corridor
- Strategically influencing current and future public policy
- Developing clear and transparent performance measures to gauge impact "

The presidents of NDSU and the University of North Dakota (UND) are members of the VPP's Steering Committee. With funding from the VPP, the Grand Forks Region Economic Development Corporation and the Greater Fargo/Moorhead Economic Development Corporation jointly retained Fourth Economy Consulting to create an *Economic Development Action Plan* for the Red River Valley.

EKA's preparation of its NDSU *Research and Innovation* assessment coincided with VPP's review of Fourth Economy's draft *Strategic Plan and Action Agenda*. Since both studies were nearing completion during similar timeframes, material cited here is based on the most recent review draft that was made available to EKA in mid-March 2014.

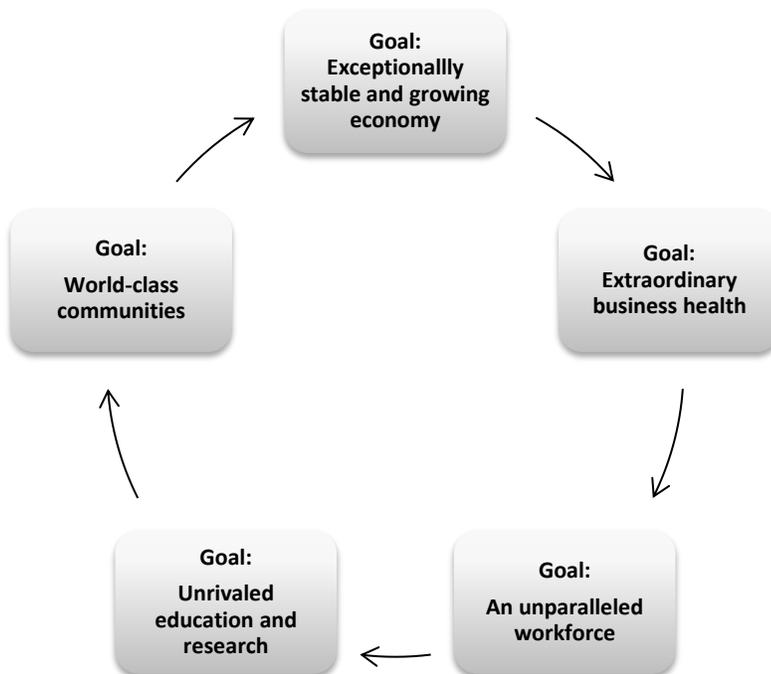
Vision, Goals and Metrics

The VPP vision is for the Red River Valley *to achieve and be recognized for its world-class economic performance and sustained prosperity through the success of its businesses and high quality of life.*

VPP then identified six high-level, overarching goals. Success in achieving each of these is inextricably linked, as suggested by the accompanying diagram.

As the Fourth Economy draft explains:

“In order to monitor the Valley’s economic health and progress, the VPP has created an indicator dashboard. These higher-level metrics are associated with each of the VPP’s established goals. While additional measures can be added over time or changed as needed, these initial indicators are readily accessible and updated regularly by reputable, third party sources. At the end of each year, the VPP will develop an annual economic performance report and host a networking event to evaluate the progress and suggest changes to dashboard and the strategic priority work plan as needed.”



VPP Priorities

The core of the *Strategic Plan & Action Agenda* is expressed in six key *Priorities* designed to advance the Goals:

- Attract, Develop and Retain Talent
- Ensure Water Security and Management
- Expand Research Capacity and Relevancy
- Accelerate Entrepreneurial Activity and Output
- Invest in Critical Infrastructure Development and Capital Improvement Projects
- Define and Improve the Internal and External Perception of the Valley.

It is self-evident that at least the first four of these connect directly to the interests of NDSU, and to issues being addressed in the different, NDSU-centric scope of EKA’s assignment.

Each *Priority* is explained in an analytical background statement (*Call to Action*). The *Priority* statement is supported by a series of specific *Strategies* that outline detailed *Actions* or initiatives to advance them. Finally, key *Partners / Stakeholders* are identified; in some instances, *Timelines and Resource Needs* also are spelled out.

Additional material taken directly from the VPP draft Plan, with some comments on its relationship to NDSU’s *Research and Innovation Strategy*, are provided as Exhibit 3.

Consultants Observations

As NDSU seeks to carve out a future competitive position in *Research and Innovation*, it clearly is important to align its strategies, where appropriate and practical, with the economic development priorities of Greater Fargo-Moorhead and the priorities of the larger Red River Valley region—as well as with the State’s goals.

Since Senator Dorgan’s initiatives to promote the Red River Valley Research Corridor (both as a place and as an organization), it has been understood that synergy and critical mass of assets could be achieved more readily through a regional approach.

As our national struggles to practice *regionalism* in the last few decades make clear, achieving effective, lasting regional cooperation never is easy among economic development agencies and leadership. Nor is it always easy to structure collaborations between universities (and community colleges) which, in general, compete for both students and financial resources.

In the Red River Valley, the proximity of the two urban centers and the two major research universities (about 80 miles apart) means that a very significant percentage of the State’s *knowledge assets* lie within a drivable region. This proximity may make regional collaboration slightly easier than it is elsewhere.

The Valley Prosperity Partnership’s platform for creating a robust game plan that promotes the shared interests of the Red River Valley communities and its educational institutions is now a new, important context for NDSU’s institutional *Research and Innovation* strategies. Strong business community leadership in advancing a common agenda represents a significant opportunity for NDSU and the RTP to acquire advocacy for priority investments.

At the next layer, there is the intriguing question of whether there might be an (even larger) *East plus West* regional / state strategy. As the Red River Valley pursues its growth and prosperity agenda, how can that agenda maintain its focus on the region, but also connect more strategically and pervasively with the opportunities and challenges arising in the West?

6—CONTEXT: NORTH DAKOTA STATE UNIVERSITY

In answering questions about *Research and Innovation*, interviewees provided a significant body of observations about the University—as broader context for the current state of *Research and Innovation*. Selected information about the University is thus the last *context* section, before the *Assessment* sections of this report.

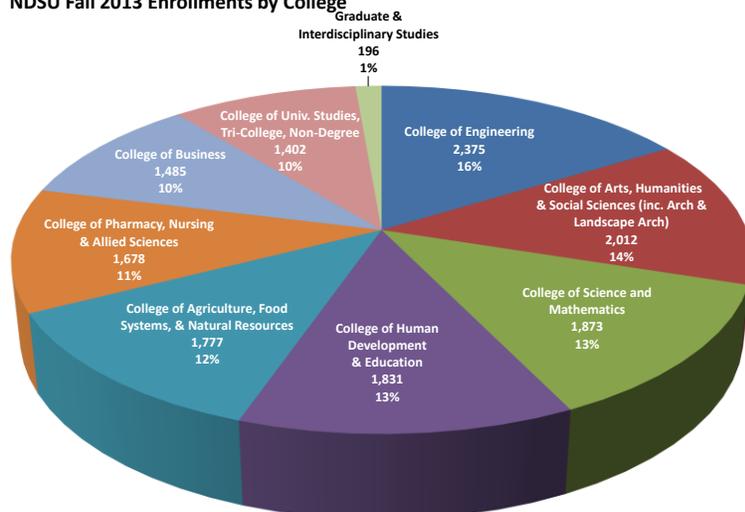
Learners: NDSU’s Contributions to Human Capital

The Professional Workforce

Once one embraces a definition of *Innovation* that begins with the formation of *Human Capital*—the supply of educated people who will create or populate 21st century businesses and professional occupations—then, the matter of enrollment takes on specific relevance as part of an *Innovation Strategy*.

In Fall 2013, NDSU enrolled 14,629 students, of which about 12,000 were undergraduates and nearly 2,700 were in graduate programs. As the adjacent chart shows, the majority of NDSU students are enrolled in colleges that are *primarily professional and technical disciplines*. NDSU must be contributing quite significantly to the State’s and region’s professional cadres.

NDSU Fall 2013 Enrollments by College



NDSU’s Role in Human Capital In-Migration

Historically, state legislatures have believed that state subsidy for attending college should go primarily to in-state students. But, for a low-population state that needs to expand its highly-skilled, well-educated *knowledge workforce*, there is wisdom and advantage in using the State’s universities as a means of attracting and retaining highly-skilled and motivated people from other states and nations.

NDSU’s service area includes all of North Dakota and 19 counties in Minnesota—all of which are within a 100 mile-radius of NDSU’s main campus in Fargo. A large portion (45 percent) of Fall 2013 NDSU enrollment comes from Minnesota and recent growth in the numbers of students coming from *non-service areas* of Minnesota has been strong.

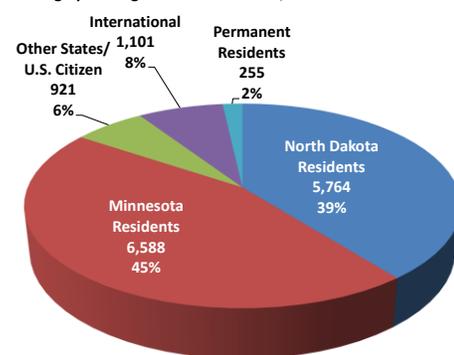
Overall, there is a very positive trend. NDSU is playing a *growing role* in supporting in-migration.

*During the past decade, rates of retention of NDSU baccalaureate graduates into ND placed employment has increased 10 percentage points for both graduates who report their "original home state" as ND and those who do not report their "original home state" as ND to 75.4 and 40.1%, respectively. Fifteen years ago, these rates were just below 60 and 25%; respectively.*¹⁵

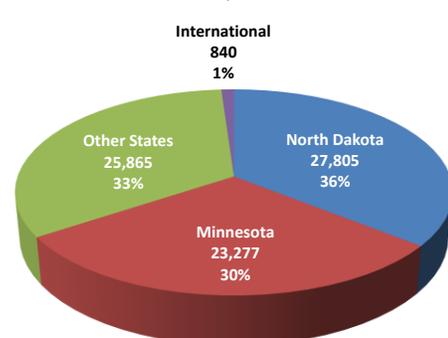
And, at the other end of the pipeline, at present, 36 percent of NDSU alumni reside in the State.

Exhibit 4 provides details about the in-migration patterns related to NDSU.

Demographic Origin of NDSU Students, Fall 2013



Residence of NDSU Alumni, 2013



¹⁵ *Immigration Rates at Which NDSU Graduates Become ND Employed* (.xls file), NDSU Career Center

University Organization

Central Administration

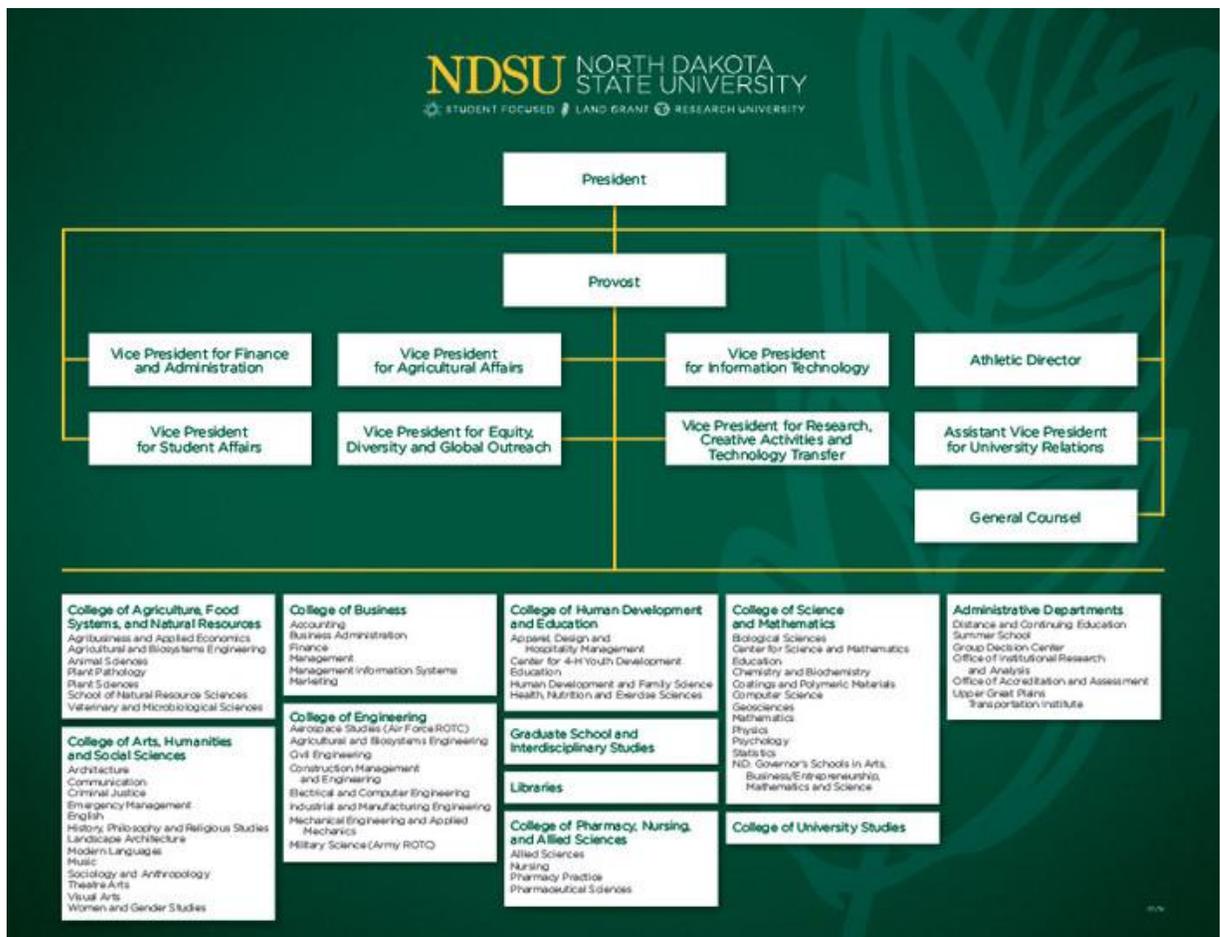
The University’s organization structure is similar to that of many other land-grant universities, and better organized than some. The executives of the Research Foundation and the Research and Technology Park also are members of the President’s Cabinet.

Also as in several other states, Agricultural Affairs is a separate agency with a separate state budget. The Vice President for Agricultural Affairs oversees the College of Agriculture, Food Systems, and Natural Resources; the Extension Service; the Experiment Station; and the Northern Crops Institute.

Two senior positions were the subject of relatively recent appointments—the Chief Business Officer and the Chief Research Officer. The Chief Information Officer is an interim appointee. NDSU has just appointed a new Provost, who will assume her post in July 2014.

Colleges

Academic units are organized in seven Colleges, plus University Studies, Honors College, and other small units. The grouping of Pharmacy, Nursing, and Allied (Health) Sciences in one College is interesting and possibly an advantage, given today’s emphasis on multi-professional education in health occupations. Having the usual array of Arts and Sciences disciplines in two colleges also is likely an advantage—making units of more manageable size and diversity.



NDSU's Reach and Partnership Development

Campus Community Partners

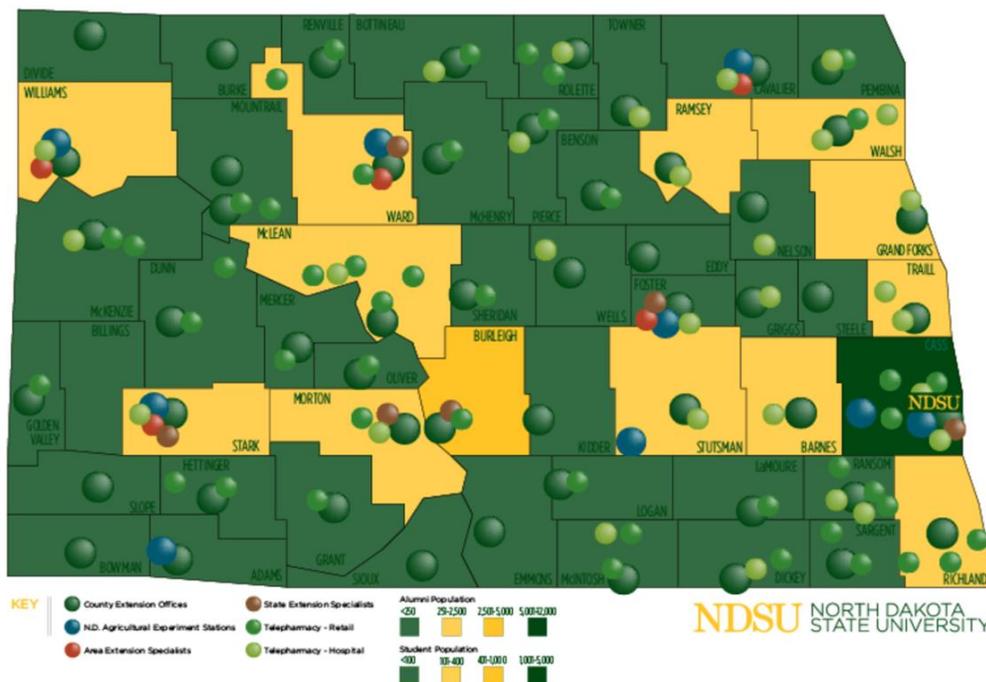
NDSU President Dean L. Bresciani has established a program to recognize private sector collaborations with the university that benefit the community. Through this program, NDSU's and the Campus Community Partner's flags are raised on the same staff, symbolically demonstrating the partnership the organizations share in the best interests of the communities they serve. <http://www.ndsu.edu/president/campuscommunitypartners/>



Physical and Virtual Presence

A very interesting page and graphic in the NDSU website shows the reach of the institution. In addition to the many traditional locations for Experiment Stations and Extension Centers, the Tele-Pharmacy program of the College of Pharmacy, Nursing, and Allied Sciences has vastly expanded NDSU's service presence into many small, rural communities. The graphic also shows the density of NDSU students and alumni, with the greatest concentration, naturally, in Fargo / Cass County. All this is captured very effectively in this graphic.

Overall, the University's presence and reach are impressive.



NDSU’s 15 Previously Established Peers with Their Locations

- Clemson University (Clemson, SC)
- Iowa State University (Ames, IA)
- University of Tennessee (Knoxville, TN)
- University of Alaska Fairbanks (Fairbanks, AK)
- University of Arkansas (Fayetteville, AR)
- University of Connecticut (Storrs, CT)
- University of Delaware (Newark, DE)
- University of Idaho (Moscow, ID)
- University of Kentucky (Lexington, KY)
- University of Maine (Orono, ME)
- University of Nebraska-Lincoln (Lincoln, NE)
- University of Nevada-Reno (Reno, NV)
- University of Rhode Island (Kingston, RI)
- University of Vermont (Burlington, VT)
- University of Wyoming (Laramie, WY)

Use of 2011 NSF Data

From December 2013 through February 2014, when EKA performed the analysis by which we derived nine new peers, and when we also performed all the comparative research performance analyses (in Section 8), the latest available year of NSF research data was 2011.

Then, as this report was in final preparation and review, NSF posted 2012 data.

The work required to re-do the peer selection analysis and the resulting comparisons is not trivial. In discussions with our client, we concluded that the update should be done at the outset of Phase 2 of this project.

It is extremely important that President Bresciani and his team should become comfortable that a proper group of peer institutions is used in planning, as benchmarks for setting NDSU goals.

NDSU’s Peer Universities

15-Institution Previously-Used Peer Group

The NDSU Office of Institutional Research and Analysis (OIRA) provided the list of institutions that, in the past, were used by the NDUS (System Office) for peer comparisons with NDSU. This list never has been updated. As one would expect, all are land-grant universities—a distinctive class of institutions in US higher education. The basis for selection of these institutions may have included program array, research, student enrollment size, budget/funding factors, or size/type of community in which they are located, etc.

Clemson University	University of Delaware	University of Nevada, Reno
Iowa State University	University of Idaho	University of Tennessee, Knoxville
University of Alaska, Fairbanks	University of Kentucky	University of Rhode Island
University of Arkansas, Fayetteville	University of Maine	University of Vermont
University of Connecticut	University of Nebraska, Lincoln	University of Wyoming

10 Upper Great Plains / Low Population States Peers

In addition, in interviews, many commented about comparisons with regional peers—public institutions in low-population Upper Great Plains states. This group, with some land-grant institutions and some that are not land-grants, includes:

Boise State University	University of Idaho	University of North Dakota
Idaho State University	South Dakota State University	University of South Dakota
Montana State University, Bozeman	South Dakota School of Mines & Technology	University of Wyoming
University of Montana		

A Proposed Peer Group for Research / Innovation Planning

The EKA team felt that it would be useful to compare baseline research performance statistics (which analysis is provided in Section 8). As we undertook that exercise and examined preliminary comparisons for R&D, we concluded that the current peer groups may not be the best for comparative analysis and setting targets/benchmarks for NDSU’s *Research and Innovation* activities. NSF’s 2011 data—the latest then available—were used.

We undertook to find a peer group that might be more relevant for NDSU’s specific purposes in *Research and Innovation* strategy planning. To do this, we combined three factors:

- An EKA-calculated an *NDSU Similarity Index* (similarity of research by discipline)—which generated a list of 15 institutions, eight of which were on existing NDSU peer lists
- Only land-grant institutions ranked in the top half (top 25) in Agriculture
- Institutions ranked lower than 35 in Non-Medical Research Expenditures (NDSU = 94).

The nine peers that resulted from this analysis (and the peers that EKA proposes might be used for NDSU’s planning of *Research and Innovation* strategies) are as follows (first two columns):

Current Peers (3)	Aspirational Peers (6)	Less Similar but Useful as Case Studies
University of Arkansas, Fayetteville	Mississippi State University	North Carolina State University
Kansas State University	Iowa State University	Virginia Tech
Auburn University	Oregon State University	Washington State University
	Louisiana State University, Baton Rouge	
	University of Georgia	
	University of Kentucky	

The peer analysis, including an explanation of our calculation of *NDSU Similarity Index* values, and our use of the Agricultural and Non-Medical Research rankings, is provided as Exhibit 5.

NDSU Strategic Planning

Mission / Vision

NDSU is a student-focused, land-grant, metropolitan research university in Fargo, with Research and Extension Centers (RECs) in eight statewide locations and individual Extension agent offices in every county of North Dakota. Based on 2008-2010 data, the Carnegie Commission for the Advancement of Education included NDSU, for the first time, among 108 US universities categorized as *Research University / Very High Research Activity*.

NDSU Strategic Planning Committee Recommendations

EKA did not find a document that might look like a formally-published Strategic Plan. We learned that there are *Roadmap* documents, but we have not accessed them. It is surely the case that every person's idea of what constitutes a strategic plan, and the forms such plans take, can vary widely. On the University's website, there is a page for *Strategic Planning*. It summarizes recommendations of the Strategic Planning Committee (June 1, 2011), containing some quite interesting material. One notable point is the *three elements used to define an excellent program* (see textbox highlighted in blue below).

The Strategic Planning Committee, representing university faculty, staff, and administrators, envisions North Dakota State University as a comprehensive and diverse institution with the characteristics of a top-20 research university that impacts the region, nation, and the world. As a student-focused Land Grant research university, we believe that we are uniquely positioned to achieve this vision.

Pursuant to the charge given to us by the President to identify key characteristics of programs that had achieved or had the potential to achieve excellence, three areas were identified as being integral to excellence in academic and research programs across disciplines. In all cases, the ability to attract and retain high-quality students and faculty, to give those individuals the tools they need to realize their potential, and to demonstrate the impact of the program in the region, nation, or world defines an excellent program. The top 20 nationally recognized programs in their respective disciplines were chosen as the standard of excellence.

A clear recognition that human, physical, and technical infrastructure support is critical for excellent programs to flourish and programs with great potential to achieve excellence resonated at every level of committee discussion. A university plan for infrastructure improvement and maintenance was seen as a foundational step in achieving and sustaining excellence. The committee strongly recommends that an independent development foundation dedicated to academics and research be established to realize the vision achievable by reaching the criteria listed below. In addition, the committee recommends that the existing Honors Program be bolstered and increase its offerings with the ultimate aim of converting it to a residential Honors College. Moreover, international experiences, both on campus and abroad, will be essential to providing exposure to diversity required to address ever-increasing economic, health-related, political, and social globalization.

We appreciate the idea of benchmarking to top 20 nationally recognized programs, with the observation that this also is a good idea for any future multidisciplinary programs, not just for the disciplines. The framework is followed by details on three elements:

- Human Capital
- Opportunity
- Outcomes.

The material in these sections is interesting—especially the set of metrics included under *Outcomes*. The full text of this web page is provided as Exhibit 6.

It is our understanding that the next level of strategy formation was the creation of **Academic Roadmaps**—an exercise that remains in process.

NDSU Mission

With energy and momentum, North Dakota State University addresses the needs and aspirations of people in a changing world by building on our land-grant foundation.

NDSU Vision

We envision a vibrant university that will be globally identified as a contemporary metropolitan land-grant institution.

NDSU's Relationships with the University of North Dakota

Although it is completely common for rivalries to exist among public research institutions in the same state, there is a history of partnerships between NDSU and UND, as well as a working relationship between the NDSU RTP and the Center for Innovation at UND (UND's counterpart organization dedicated to commercialization and innovation).

Academic / Research Relationship Examples

The consultant team learned of three areas of present academic / research collaborations and opportunities to expand these. There may be several others.

- **Entrepreneurship Program.** UND has enrolled NDSU students in entrepreneurship courses online for a number of years. There is no co-teaching; UND provides all the content. Designated Business School faculty and administrators at the respective schools coordinate the program.
- **Unmanned Aircraft Systems (UAS).** The two universities have new opportunities to collaborate in the field of Unmanned Aircraft Systems (UAS). UND historically has been a strong player in this field through its John D. Odegard School of Aerospace Sciences, and its Center for Unmanned Aircraft Systems. The State now has established the Northern Plains Unmanned Systems Authority, and recently NDSU's VPR was added as a member. NDSU brings many complementary capabilities to this effort in applied sciences, notably in Engineering and Agriculture. This year's designation by the Federal Aviation Administration of the Northern Plains Unmanned Aircraft Systems Test Site, as one of six national locations for future development of these technologies, has accelerated this opportunity.
- **Bakken Oil Fields.** Some NDSU researchers from the College of Agriculture have been active in working on issues related to the Bakken Oil Fields, but there are perceptions that UND has been much more actively engaged, including through its Center for Innovation. While UND has historically been the dominant player in energy research through its Energy and Environmental Research Center, the view of oil industry representatives is that there exist many more opportunities for NDSU to play an active role in addressing solutions to a wide range of Bakken issues, ranging from scientific and technical to matters of urban development and delivery of services to the region's growing population.



Innovation and Entrepreneurship Examples

The NDSU RTP/Incubator and UND Center for Innovation have worked together for nine years on various initiatives. And personal relationships between management go back as far as 30 years.

- **University Center Program—US EDA.** The two organizations partnered on a joint grant from the US Economic Development Administration under its University Centers Program. (During the management transition at the RTP, this collaboration ended.)
- **Technology-Based Entrepreneurship Grant.** Recently, the RTP and Center for Innovation have made a joint submission to the North Dakota Department of Commerce under the Technology-Based Entrepreneurship Grant program. The request is for \$300,000, to be divided evenly. The work plan includes deliverables tied to VPP goals.

In addition, the two research universities collaborate on state policy development initiatives. There is a clear perception that the two universities can garner greater state support when they collaborate, whether on policy proposals or on joint-venture program initiatives.

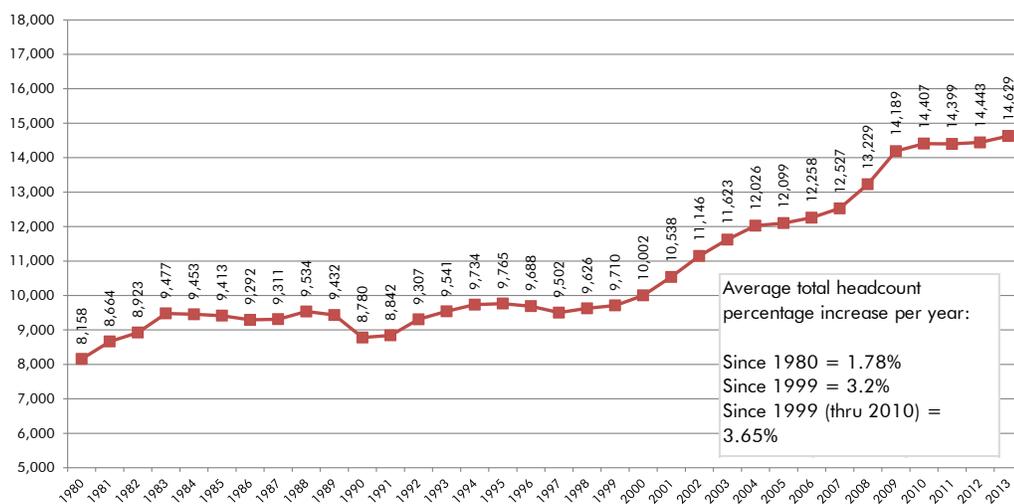
Rapid Institutional Growth, Paired with Chronic Underfunding

In Section 4, above, we have commented on the history of relatively low funding to higher education in North Dakota, a trend now being reversed. This brief discussion is to look more closely at funding and growth at NDSU, specifically.

Rapid Growth

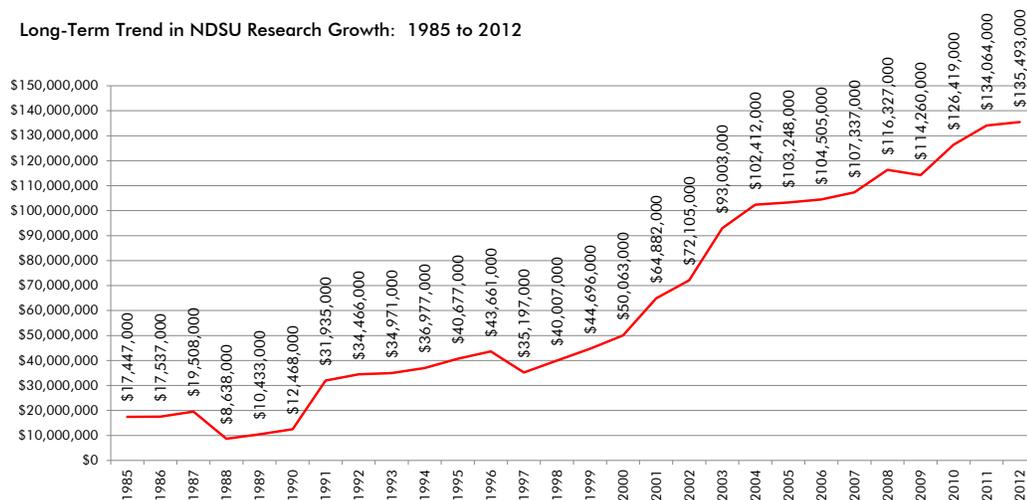
Several interviewees commented on the fact that the University has grown significantly in the recent past and that the size of its faculty and aspects of administrative and facility infrastructure have not kept pace with that growth. To test that idea, we reviewed some basic enrollment trend data and research growth data—looking at the period beginning in 1980. As the graph shows, the average rate of growth (in this case, measured by student headcounts) has been accelerating.

NDSU Headcount Students: Change from 1980 to Present



In a similar nearly three-decade timeframe, research growth has been very significant.

Long-Term Trend in NDSU Research Growth: 1985 to 2012



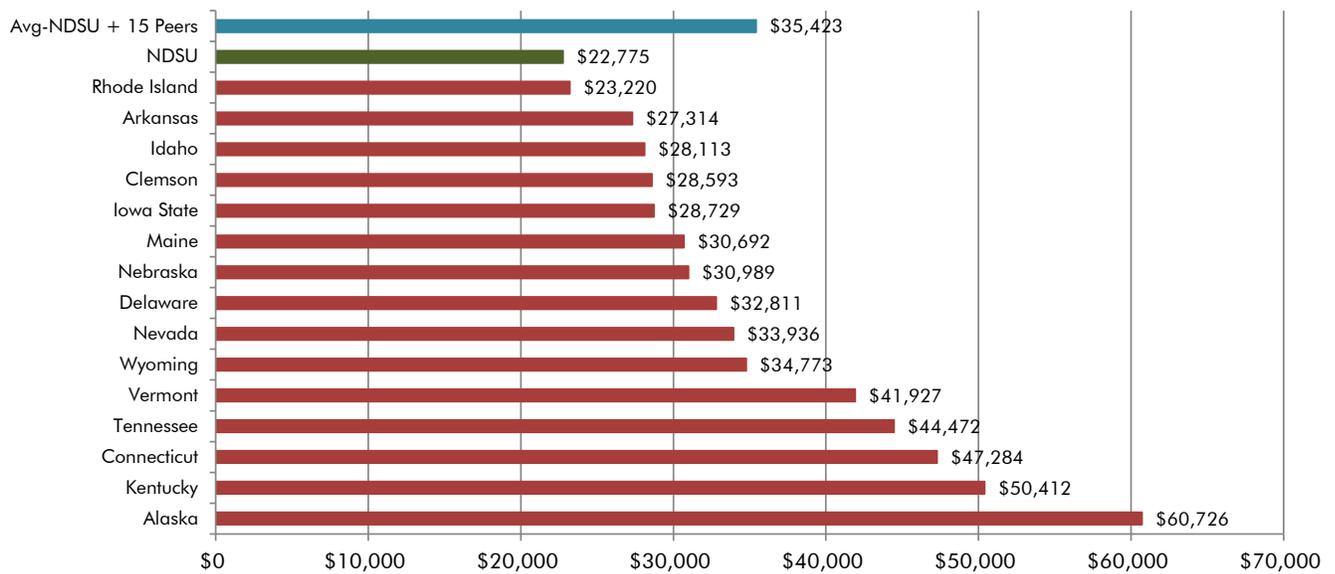
There were two periods of slightly negative research growth in the late 1980s and late 1990s. The strongest sustained growth period was from 1998 through 2004. Growth has been slightly slower since then, but still is notable.

Comparison of Total Resources per FTE

As discussed above in Section 4, North Dakota clearly has raised the bar very significantly in its per student funding / appropriations in recent years, and the State has adopted a new funding formula that will recognize discipline and level of instruction differences.

However, there is a catch-up issue. Based on IPEDS data supplied via NDSU’s OIRA, NDSU has lower than average *Total Expenditures (Resources) per FTE* student—in comparison with the peer group formerly used by the NDUS. (*Expenditures per FTE* include all revenues, except auxiliary revenues, *not just appropriations*. Thus, for example, institutions with higher tuition / fees or other higher revenues would have more to spend per FTE).

Total Expenditures (Resources) per FTE Student—NDSU and 15 NDSU (OIRA) Peers: Average of 2010, 2011, and 2012



Resource Needs Identified by the Deans

In interviews with deans, EKA learned that, in the *Academic Roadmap* process, deans identified some institution-level resource deficiencies that should be addressed in order to sustain growth and excellence. Following is the text of a document provided to EKA.

Academic Affairs Overarching Priorities

January 18, 2013

The deans have developed 5 new roadmap proposals that we have determined are overarching priorities that would benefit the stature of NDSU as a nationally respected land-grant research university. These proposals are not directed at a particular college; rather they provide enhancements that will provide critical support to the entire academic structure of the campus. Because of the sweeping nature of these enhancements, we have chosen to create separate categories for these priorities, rather than ranking them among the priorities of specific colleges.

Enhancing Doctoral Education through Support of Graduate Assistants

Recruitment of doctoral students is a highly competitive process that requires offering a competitive compensation package for graduate assistantships. Currently, NDSU does not offer health benefits for GAs and our stipends lag behind those offered by peer institutions. Providing health benefits, increasing stipends, and offering more assistantships will help NDSU to attract additional high caliber doctoral students to support our research efforts.

A Library for a Carnegie Very-High Research University

Enhancement of NDSU's status as holder of this Carnegie classification depends upon the availability of library resources to support the research, teaching, learning, and other information needs of the campus community. The range of the Libraries' databases must be expanded to a parity level with NDSU's IPEDs peers in order to provide needed resources to our faculty and students and enhance NDSU's stature among its peer institutions. The Faculty Senate identified funding of this recommendation as an urgent and high priority.

Building the Foundation for the Academic Roadmap – Faculty Resources

Across campus, many existing tenure-track faculty positions lack funding. These are mission critical positions, located in some of our most productive departments and programs. In addition, a few strategically important positions have not yet been fully funded, even though commitments have been made by past and current administrations. Putting these positions on a firmer foundation is a prerequisite to making significant progress towards NDSU's broader goals.

Building the Foundation for the Academic Roadmap – Supporting Student Success

In January of 2012, the provost proposed several goals for academic affairs. Through bolstering extra sections funding, the colleges can offer more financial support to doctoral students, thereby increasing the likelihood that we can attract a higher number of Ph.D. applicants and enrollees. We can also provide a larger number of doctoral students with teaching opportunities to enhance their professional development and marketability.

A Financial Plan for Development and Sustainment of New Masters Education Programs

A funding pool will be created that can be used to finance the start-up of new professional/applied masters programs in areas of strength. In order to assure that adequate incentive and support will be present to develop and sustain these programs, a mechanism will be derived by which the majority of tuition dollars that are paid by the students in a particular program will be returned to the college offering the academic program. After a deduction for administrative costs, the remaining revenue will be used to support doctoral education.

Consultants' Observations

Human Capital Contributions

As part of NDSU's broad agenda for supporting North Dakota's economic prosperity, any strategies that continue to increase the number of qualified in-bound students or that succeed in retaining them in North Dakota to work and start businesses is very good for the State's Innovation Economy. In Phase 2, it may be useful to study the demographics further; design NDSU strategies for further serving to enhance in-migration; and to set targets/goals for using NDSU to expand the State's Human Capital.

Fast Growth and Lagging Internal Infrastructure

For a corporation, three decades is a long time. However, since 30 years is actually a *short* time-span in the life of a higher education institution, in many respects, NDSU as a major research university is a young or new institution—very different from the smaller, perhaps regional institution that it was for much of its history. In our view, this institutional youthfulness explains many of the current strains. The internal infrastructure, in various ways, has not caught up with what one would expect it to be for an enterprise of this current size and complexity.

History of Underfunding and Current Opportunity

There is evidence that, in the past, NDSU was underfunded vis-à-vis institutions that are considered peers. States rarely fund research directly in formulas, but an overall low level of appropriations, non-competitive graduate student stipends, faculty salaries, low levels of funds available for grant development, and other related funding factors, indeed would have made it difficult for faculty to focus on research grants. It also might have been a negative factor in the University's ability to recruit in large numbers the type of faculty who are competitive in research funding.

Now, happily, the recent trend, the immediate situation, and future prospects are very different. **This Governor and Legislature have definitely *raised the bar*.** The State's leadership and its economic prosperity mean that the potential funding environment for the University is as positive as it has been in recent history, and certainly much better than the environment is now in most other states.

North Dakota's leadership is turning what was an historical weakness into a current and future strength.

Private / Philanthropic Funding Potential

In this Phase 1 work, EKA did not seek to evaluate past or current philanthropic fundraising strategies. We do know that there is new leadership in this area—and likely new strategies. From the collective interviews, it is our general impression that there are large corporations and wealthy individuals who either already are, or could become, major investors in the right kinds of University initiatives. This could take the form of operating funds, capital gifts, or endowments for specific areas of research—among other types of donor support. Developing a strong and clearly-focused *Research and Innovation Strategy*, with specific areas for priority investment would definitely aid the Institutional Advancement staff in matching research-related needs with donor prospects.

Reach and Partnerships

There were a few interviewees who expressed the view that NDSU's *past* image (except for Agriculture) was as *the University of Fargo*. In reality, the University is well-aware of its many *geographies* for engagement, partnerships, and impact: Local, Regional, State, National, and Global. *NDSU Reach* information on the website shows clearly how the University is engaged across the entire State, in multiple ways, and Tele-Pharmacy is a world-class, recent example. There are many existing collaborations at other levels.

That said, it is not possible to conclude that collaborations and partnerships are a particular strength of NDSU at present. Another, more elevated level of focus on building mechanisms, skills, and culture for *Partnership Development*, as other universities are doing—particularly with business, industry, and North Dakota communities—is needed.

In today's world, partnerships and collaborations are no longer optional; they are essential pathways to progress. Thus, having a high *Partnership IQ* is now a competitive advantage. Many models already exist within NDSU and elsewhere that can be adapted more broadly; but, first, partnerships must be acknowledged as a strategic priority for the University. The RTP is a potentially significant vehicle and ally in this endeavor—especially for the Local / Fargo / Regional / Red River Valley, and even for national geographies.

7—ASSESSMENT: PERSONNEL, ORGANIZATION AND ENTITIES FOR RESEARCH AND INNOVATION

Personnel Performing Research

Clearly, a University’s most important assets for *Research and Innovation* are its research-performing personnel—including faculty, non-faculty research staff, graduate students, and post-docs. Following is selected information.

All Research Personnel—A Quick Comparison

Using data reported to NSF, a comparison of research personnel with nine EKA-proposed peer institutions shows that, overall, NDSU has fewer Principal Investigators and Other Personnel (engaged in research) than the average of these institutions.

2011 or 2012 NSF Data

As noted in Section 6, due to timing, most of the NSF data in this report are 2011 NSF data. In a few cases, where we added additional analyses (such as this page), we were able to use 2012 data.

Comparison of Research Personnel—NDSU and Average of 9 Peers: 2012				
	All personnel			Postdocs ^a
	Total	Principal Investigators	Other Personnel	
North Dakota State University	2,782	252	2,530	63
University of Arkansas, Fayetteville	3,295	678	2,617	74
Kansas State University	4,245	381	3,864	39
Auburn University	1,992	340	1,652	87
Mississippi State University	4,167	434	3,733	99
Iowa State University	4,242	736	3,506	317
Oregon State University	4,625	1,027	3,598	177
Louisiana State University, Baton Rouge	3,584	649	2,935	108
University of Georgia	7,338	343	6,995	388
University of Kentucky	6,170	1,545	4,625	451
Average - 9 EKA-Proposed Peers	4,406	681	3,725	193
^a Postdocs are included in totals reported for all personnel. Postdocs are personnel with doctoral degrees generally awarded within last 5 years and who are working for an institution under a limited-term appointment for training in research.				
Source: NSF HERD Survey, Table 74. Headcount of R&D personnel at higher education institutions, by state, institutional control, and institution: FY 2012				

Faculty—A Few Descriptive Statistics

EKA is not evaluating these selected faculty characteristics, but presenting them here in case they should become a target of goal-setting for the future *Research and Innovation* strategy.

Tenured and Tenure-Track Trend

As the table shows, 49.1 percent of NDSU’s tenured / tenure-track faculty are tenure-track, versus 25 percent for NDSU’s 15 peers (one half of NDSU’s percentage). The current 49.1 percent of NDSU grew from 33.2 percent in 2000 (16 percentage points).

Tenure Status	2011	2009	2007	2000
NDSU Tenured	50.9%	50.0%	57.5%	66.8%
NDSU Tenure Track	49.1%	50.0%	42.5%	33.2%
NDSU 15 Peers Tenure-Track	25.0%			

Source: Animal Sciences Graduate Seminar, William Slanger, OIRA, NDSU April 4, 2014, page 43

Full-Time / Part-Time and Terminal Degrees

Based on data from IPEDS Common Data Set, at NDSU, 23 percent of faculty is part-time, while the average for the nine EKA-proposed peers is 17 percent. In this group, Oregon State is an outlier, at 31 percent.

In the percent of full-time faculty with terminal degrees, NDSU (at 85 percent) is slightly below, thus consistent with, the 9-peer average (89 percent).

Institution	% Faculty that are Part Time	% Full Time Faculty with Terminal Degree	% Part Time Faculty with Terminal Degree	% Full + Part Time Faculty with Terminal Degree
North Dakota State University	23%	85%	39%	75%
University of Arkansas, Fayetteville	14%	85%	33%	77%
Kansas State University	16%	84%	60%	78%
Auburn University	13%	95%	60%	90%
Mississippi State University	14%	80%	49%	76%
Iowa State University	17%	94%	63%	88%
Oregon State University	31%	85%	53%	75%
Louisiana State University, Baton Rouge	13%	88%	62%	85%
University of Georgia	15%	94%	66%	90%
University of Kentucky	19%	93%	57%	86%
Average for 9 EKA-Proposed Peers	17%	89%	56%	83%

Source: NDSU OIRA and *Common Data Set*, Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics

Faculty Workload—A Factor in Research Performance?

EKA did wish to look at workload data, as this subject came up in some interviews as a possible factor in research expansion.

Faculty Allocation of Time—Overall

Two surveys, in 2007 and 2011, provide some general insight on how NDSU faculty members allocate their time.

Overall, teaching faculty spends an average of 56 hours per week working, and this did not change from 2007 to 2011. If one includes *Research and Scholarly Activity* and *Working with Undergraduates on Research*, approximately one-quarter of weekly time is devoted to these activities. (These data are not organized to separately report work on funded research projects versus other scholarly or creative activity. We may assume that both funded and non-funded scholarly work hours are included in the time allocated to *Research and Scholarly Activity*.)

Faculty Time Applied to Faculty Functions: 2007 and 2011				
Faculty Activity	Spring 2011		Spring 2007	
	Hours per Typical 7-Day Week	% of Time	Hours per Typical 7-Day Week	% of Time
Teaching undergraduate students in class	6.1	10.9%	7.0	12.5%
Grading papers and exams	5.5	9.8%	5.5	9.8%
Giving other forms of written and oral feedback to students	4.8	8.5%	4.2	7.5%
Preparing for class	8.0	14.2%	8.2	14.6%
Reflecting on ways to improve my teaching	3.3	5.9%	3.3	5.9%
Research and scholarly activities	12.0	21.4%	11.7	20.9%
Working with undergraduates on research	2.8	5.0%	2.0	3.6%
Advising undergraduate students	3.0	5.3%	3.0	5.3%
Supervising internships or other field experiences	1.8	3.2%	2.3	4.1%
Working with students on activities other than coursework (committees, orientation, student life	1.9	3.4%	2.3	4.1%
Other interactions with students outside of the classroom	2.9	5.2%	3.0	5.3%
Conducting service activities	4.2	7.5%	3.7	6.6%
Total Hours per Typical Week	56.2		56.1	
Source: <i>Faculty Survey of Student Engagement</i> , 2007 and 2011, provided to EKA by Office of Institutional Research and Analysis, NDSU.				
Notes:				
1. "Non-Teachers" were not included in the samples.				
2. Any responses which reported more than 100 hours per week were deleted. There were 5 in 2007 and 8 in 2011.				
3. 2007 Survey: 65% response rate, n = 195, with 62 teaching mostly freshman and 122 teaching mostly seniors, and 7 teaching "other" and 4 missing this information.				
4. 2011 Survey: 49% response rate (still higher than national), n = 147 with 45 teaching mostly Lower Division and 86 teaching mostly Upper Division and 15 "other" and 1 missing this information.				

Teaching Workloads by Instructional Categories

Based on the data shown here, it appears that teaching loads actually have decreased in the last several years, except for instructors that are not tenure-eligible.

NDSU: Change in Instructional Load (Credit Hours Taught or SCH) by Instructional Categories: 2007 to 2012	
Instructional Category	Average Increase (Decrease) in SCH per Instructor
Tenured Instructors	-10.1%
Tenure-Eligible Instructors	-25.0%
Not Eligible Instructors	2.6%
Source: NDSU OIRA	

Student: Faculty Ratio

For a more detailed look, NDSU’s OIRA provided data on instructors, students, ratio of students to instructors, and costs per these FTEs.

According to OIRA, the ratio of *Production FTEs* (Students) to *Academic FTEs* (Instructional Personnel) is hypothetically in balance, if its value is at or near 1.0. A value of 1.0 means that state appropriations provide about enough instructional personnel to cover instructional production requirements.

As can be seen in the trend, under this assumption, there was some overload (meaning insufficient instructional personnel), ranging from 1.08 to 1.21, from 2005 to 2011. Probably now that state appropriations per FTE have been higher in the last several years (see discussion above), the FTE Ratio is now in the range of 1.00. As a result of enhanced funding, presumably *Academic FTEs* now are in balance with *Production FTEs* (demand).

This may still mean that there is insufficient faculty time / capacity to work on research program development and grant-writing. These become more time-consuming, as the funding programs are increasingly interdisciplinary and large-scale. Put another way, assuming these data reflect the situation accurately, there may be enough instructional personnel to cover teaching, but there still may be no excess capacity for generating research.

NDSU: Trend in Academic (Instructor) FTEs and Production (Student) FTEs, FTE Ratio, and Cost per FTEs and Student Credit Hours (SCH): 2005 - 2013											
FTEs and Costs	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Annual Trends	Yearly Increase Multiplier
Academic FTEs (Instructors)	450.18	490.60	520.02	527.06	545.41	596.17	583.98	623.02	661.32		1.056
Production FTEs (Students)	549.21	551.09	562.65	582.37	598.06	670.34	691.26	654.70	669.41		1.029
FTE Ratio (Production / Academic)	1.21	1.12	1.08	1.10	1.10	1.13	1.19	1.06	1.01		0.975
Cost Per Production FTE	\$56,978	\$64,773	\$67,773	\$70,093	\$75,120	\$71,786	\$71,950	\$82,732	\$90,218		1.068
Cost Per Academic FTE	\$69,511	\$72,759	\$73,329	\$77,449	\$82,372	\$80,717	\$85,167	\$86,940	\$91,321		1.040
Production SCH (Student)	320,344	324,196	324,503	335,349	354,625	381,667	381,855	366,848	371,881		1.022
Cost Per Production SCH	\$98	\$110	\$118	\$122	\$127	\$126	\$130	\$148	\$162		1.075
Notes:											
The FTE Ratio results from dividing student production FTE, which is a measure of teaching amount by Academic FTE. ONE interpretation is that a ratio of 1.00 means the State is providing enough money to pay for enough instructional personnel to meet student teaching demand fairly, i.e., not an overload with a ratio greater than 1.0 or an underload with a ratio less than 1.0.											
Source: NDSU OIRA											

A Comparison with Peers

Again as a result of recent funding enhancements, NDSU’s teaching workload, as reflected by the ratio of student to faculty, has become more favorable (i.e., decreased), from 19.6 students per FTE faculty member to 18.0—while that of these nine institutions, on average, has increased.

In 2004, NDSU’s ratio was higher than the average for these peers; now, in 2013, NDSU’s ratio is lower. Clearly, the trend among these peers is that student: faculty ratios have increased. The fact that so many institutions have lost ground in this ratio is undoubtedly due to the big trend of significantly reduced state appropriations for public higher education in many/most states. And, as noted above, North Dakota has been investing more than ever in its institutions.

Comparison of Student: Faculty Ratios—2004 and 2013: NDSU and 9 EKA-Proposed Peers			
Institution	Ratio of Students to Faculty Fall 2013	Ratio of Students to Faculty Fall 2004	Ratio Direction: 2004 to 2013
North Dakota State University	18.0	19.6	Down
University of Arkansas, Fayetteville	19.0	16.9	Up
Kansas State University	19.0	20.7	Down
Auburn University	18.0	16.0	Up
Mississippi State University	19.0	16.9	Up
Iowa State University	17.9	15.5	Up
Oregon State University	20.7	19.0	Up
Louisiana State University, Baton Rouge	23.0	22.0	Up
University of Georgia	17.0	17.7	Same
University of Kentucky	18.0	16.5	Up
Average for 9 EKA-Proposed Peers	19.1	17.9	
Note: Ratios are calculated using FT + .3333 PT to calculate FTE faculty (per Common Data Set, IPEDS)			
Source: NDSU OIRA and <i>Common Data Set</i> , Integrated Postsecondary Education Data System (IPEDS), National Center for Education Statistics			

Faculty Groups Involved in this Study

University Distinguished Professors and NSF Career Awardees

Becoming a University Distinguished Professor (UDP) is the highest honor that can be awarded to a faculty member at NDSU. A University Distinguished Professor is expected to have demonstrated, and is expected to continue to model, the high ideals of a student-focused, land-grant, research university. NDSU faculty also includes NSF Career Awardees.

The EKA team conducted interviews with the NDSU Distinguished Professors and NSF Career Awardee groups—which afforded us the views of the University’s most senior, most research-accomplished faculty. It is our view that these groups of faculty can and should represent faculty views in the strategic dialogue about *Research and Innovation*.

NDSU Innovation Group and Bison Ventures / Bison MicroVentures

There exists a small, self-selected and self-organized faculty group that is interested in innovation. (Several stakeholders from the business community called this to our attention.) In this Phase 1 Assessment, the EKA team interviewed two:

- Dr. David Wells, Professor, Dept. of Industrial & Manufacturing Engineering
- Dr. Andrew Mara, Asst. Professor, Department of English

We note how charmed we were to find an Engineering professor and an English professor sharing interest in this topic. This group may be instrumental in providing leadership examples and a way to expand faculty interests in innovation partnerships—and, importantly, for weaving innovation and education activities together.

The *Innovation Group* faculty has led development of curriculum in the College of Engineering and Architecture (Department of Industrial and Manufacturing Engineering)—elective, credit-bearing programs—*Bison Ventures* and *Bison Microventure*—both linked to the *Innovation Week / Challenge* program of NDSU RTP. Programs are described as follows:¹⁶

Bison Ventures are elective activities that focus the creativity and technological expertise of students towards innovation, invention and entrepreneurialism. Numerous *Bison Ventures* are active at any one time, and the topics are as broad as the collective imaginations of the students and faculty involved. All, however, are working on advanced ideas that are directed towards invention of new products, innovation in engineering processes and commercialization of laboratory research. While not every venture fully realizes the ultimate pinnacle of the founding of a new company or the patenting of a new product or process, these targets are always in view.

The *Bison Microventure* is an innovation team that operates at North Dakota State University. It is best characterized as a learning experience in innovation and productization. It is part of a loose *Bison Ventures Network*, involving the College of Engineering and Architecture, the College of Business Administration and the Center for Technical Enterprise. Other colleges at NDSU and throughout the Tri-College (NDSU, Minnesota State University-Moorhead, Concordia College) area also occasionally participate in *Bison Ventures*.

In our parlance, ‘innovation teams’ combine learning, invention and entrepreneurship. *Bison Ventures* are principally learning experiences for students. The goal is to provide an opportunity for students to learn entrepreneurial skills and to create an environment that encourages the development and launch of student-led enterprises, while pursuing learning on the cutting edge of technology. Although the learning process is the dominant purpose, the *Bison Ventures Network* also provides assistance in filing patents and other intellectual property protection. Likewise, a desirable, though not necessary, outcome would be the forming of new enterprises by innovative and entrepreneurial students. Encouragement and assistance in venture formation and development is also provided to those innovation teams who evolve to that state.

¹⁶ http://www.ndsu.edu/ime/bison_ventures/

“People see Innovation as different from education. They should be one and the same.”

A few other programs focused on research and innovation came to our attention, including these examples:

- Innovation Cafes, the College of Science and Math (to get the community engaged)
- ROPES (Research Opportunities for Students)
- UG Research Mentorship Program.

These are the only NDSU research and innovation-focused programs for students, offered by academic units, that the EKA team discovered in our study process at NDSU.

Graduate Students

According to NDSU OIRA data, the numbers of masters and doctoral students engaged in research (receiving stipends) have increased in the last five years; in fact, the doctoral student increase is significant. But, at least for doctoral students, the dollar level of research stipends has not increased; in fact, it has declined.

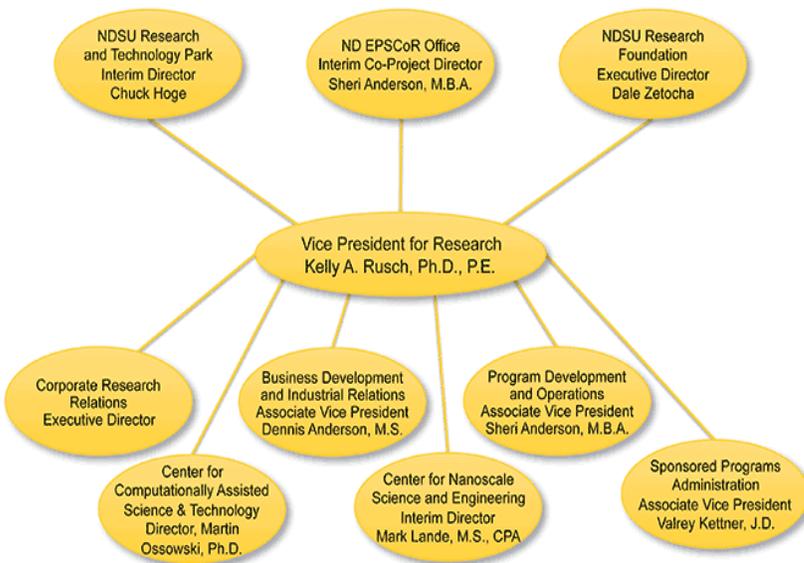
Research Stipends for Graduate Students—2009 to 2013						
Masters Students						
	2008-09	2009-10	2010-11	2011-12	2012-13	% Change-5 Years
Department Salaries	\$10,569	\$10,087	\$9,844	\$11,631	\$11,374	8%
NDSU Salaries	\$9,299	\$9,164	\$10,514	\$9,722	\$10,006	8%
Department Headcount	12	8	8	12	12	0%
NDSU Headcount	211	214	196	235	227	8%
Doctoral Students						
Department Salaries	\$16,338	\$11,036	\$11,500	\$13,875	\$14,125	-14%
NDSU Salaries	\$12,033	\$11,699	\$12,760	\$12,526	\$12,304	2%
Department Headcount	4	7	9	6	6	50%
NDSU Headcount	203	241	229	259	249	23%

Office of the Vice President for Research and Creative Activity

Current Staffing and Functions

The Office of the Vice President for Research and Creative Activity (VPRCA or VPR) currently is staffed with 16 professional and 3 support positions. The functions/positions are:

Professional Positions	
Vice President for Research and Creative Activity	Manager of Faculty Development & Special Projects
Associate Vice President, Sponsored Programs	Budget & Research Administrator Operations Manager
Associate Vice President, Program Development and Operations	Export Controls Officer (new)
Associate Vice President, Business Development and Industrial Relations	RCA Safety & Facilities Coordinator
Executive Director, NDSU Research Foundation	Communications Manager
Executive Director, NDSU Research Park	Director, Corporate and Foundation Research Relations (new)
Co-Project Director, ND EPSCoR	Director, Center for Computational Assisted Science & Technology
Director of Animal Resources & Attending Veterinarian	Interim Director, Center for Nanoscale Science & Engineering
Support Positions	
Facility and Operations Assistant	Office Assistant
Assistant to the Vice President	



VPR functions include all those normal functions found in other universities, including grant development and administration; center / institute management; business development / industry relations; regulatory compliance activities; technology transfer; management of certain research facilities; management of the Research Foundation and RTP; and reporting to the University, State, and NSF / federal agencies. As North Dakota is an EPSCoR state, this program also is among the VPR functions.

Because NDSU's Agriculture units are a separate state agency with separate budgets, the Dean of Agriculture, as Director of the Experiment Station, also is a Chief Research Officer. The Experiment Station includes six professionals and two support staff.

Agriculture Units

- NDSU College of Agriculture, Food Systems, and Natural Resources—academic programs
- ND Agricultural Experiment Station—basic and applied research
- NDSU Extension Service—education and information
- Northern Crops Institute—connecting in the global marketplace

It is our understanding that the Office of the VPR was created only in 2000, with Dr. Philip Boudjouk serving under President Joseph A. Chapman as NDSU's first VPR. Dr. Boudjouk served in the VPR capacity until recently. Dr. Kelly Rusch is NDSU's second VPR. Thus, relative to other / peer research universities, this Office of the VPR is very, very young. This is evidence that NDSU did not consider itself a serious research-performing university until relatively recently in its history—the 2000s. It also means that it might be a good time, now, to evaluate the level of staffing and resources for this Office—to ensure that it is positioned to serve future growth goals.

Effects of Strategy Shift and VPR Transition

It is EKA's understanding that NDSU's current leadership wishes to expand strategy, in general, to focus more on internal, faculty-centric capacity for research growth. If that is to be the future, then the staffing complement of the Office of the VPR, as it is now, is very thin and its operating funds are constrained:

- **Grant Support to Faculty.** Grant support personnel, including professional grant writers, to assist faculty in finding grant opportunities and in preparing proposals, are needed.
- **Systems.** Administrative / IT systems are antiquated and many transactions and approvals are manual. People literally walk around to obtain required approval signatures.
- **Compliance.** In the area of Compliance, a critical Export Controls position, that always should have been staffed, was just recently approved and added. It may be that other compliance areas likewise are understaffed.
- **Technology Transfer.** At the time of this writing, this was a one-person operation. Also, logically, the unit's expertise has been tilted to Agriculture. If / as other priority areas are expanded, more subject-matter expertise in the selected areas will be needed.
- **Travel Funds and Support for Federal Agency Relations.** Faculty and deans report that there is too little money available for travel to conferences and, in particular, to cultivate relationships with program officers in federal agencies. (It would be interesting to learn how much activity of this nature the deans fund from their ICR allocations.) But, the VPR also should have such funds to apply strategically.

Inadequate travel funds for Principal Investigators are only part of the story. There needs to be a consistent, thorough, and extensive *federal agency relationship management function*—as we are certain already exists between the Agriculture division and US Department of Agriculture. This also requires more support personnel. This is not a trivial matter. It is a well-known fact that cultivation of relationships with federal grant program personnel is an essential factor in preparation of competitive and winning proposals. As in all other endeavors, relationships matter.

It is our understanding that Dr. Rusch's appointment was followed by some internal debate about responsibility / control over certain functions—including the EPSCoR Program; space allocation in the Research I and II Buildings; direction of CNSE and CCAST; and oversight of some Office of Research staff.

Similarly, we understand that there are to be new hires in Technology Transfer and that there has been debate about how these positions would report—to the Office of Research or to the Research Foundation, or to both.

Since our first visit, it appears that several of these issues, notably EPSCoR, have been resolved, or are in process of being resolved. That is very good.

We nonetheless note that any ongoing controversies about organization and responsibilities could only be distractions from important internal capacity-building required for the University—requiring capacity-building in, and leadership from, the Office of the VPR.

Centers and Institutes

The University has a great number of Centers and Institutes, most of which are within colleges. CNSE, CCAST and some others report centrally to the VPR. Exhibit 7 provides a list from NDSU's website. This web page provides links to the center/institute websites, or, if there is no website, there is an email link for the relevant contact person.

North Dakota's Definition and Official Approvals

According to ND State Board of Higher Education Policy, Section 307.1, a *center or institute* means a unit that has as a primary function or activity academic instruction, research, or service beyond the immediate campus community. The terms do not include space designations, or units that simply have the word *center* in their title, or units that provide non-academic services, such as dining centers. Two are National Institutes of Health (NIH) COBRE Programs.

Many of the NDSU centers and institutes listed in Exhibit 7 have been officially reviewed and approved by the ND State Board of Higher Education (NDSBHE), the ND State Legislature, or the ND Centers of Excellence (ND-COE) program. Two are NIH COBRE grants.

Growth in the Last Decade

Many of the oldest Centers and Institutes were part of the land-grant formation. It also is likely that approvals of some kind were involved with other Centers and Institutes, but that that information is not captured in the list at the webpage used.

Sorting these by dates is interesting. We can see, by their names, that many of those centers/institutes for which dates are not provided must have been created quite early in NDSU's evolution. For those for which dates *are* available, sorting by dates shows stepped up activity in the creation of centers/institutes approximately since 2000. The University's growth, policy of the ND State Board of Higher Education; growth of research activity; and the COE program (beginning in 2006) all are factors in this expansion.

ND Centers of Excellence Program and Research North Dakota

Also, reporting to the VPR are 12 Centers of Excellence (NDCOE), established under a State of North Dakota program, between 2006 and 2013. These are listed, with founding dates, focus, and other data, in Exhibit 7.

The North Dakota Centers of Excellence (NDCOE) program was proposed by Governor John Hoeven and passed by the North Dakota Legislature in 2005. North Dakota's COEs are hubs of research and development partnering with private companies to commercialize new products and services. The program is overseen by the Centers of Excellence Commission which is comprised of members from the State Board of Higher Education and the Economic Development Foundation.

http://www.ndsu.edu/research/industrial_relations/ndcoe.html

http://www.ndsu.edu/research/centers_and_institutes.html

It does not appear that any new Centers have been established yet at NDSU under Governor Dalrymple's *Research North Dakota* Program.

Center for Nanoscale Science and Engineering (CNSE)

The CNSE website describes the Center as follows:¹⁷

Established in 2002, CNSE conducts large-scale, multidisciplinary research for government and industry. Located in a state-of-the-art research facility in the NDSU Research & Technology Park, CNSE employs scientists, engineers, students and faculty engaged in high level research. CNSE's Research 2 facility includes 77,000 sf of cleanroom, laboratory and engineering spaces that house its design, synthesis, fabrication and characterization capabilities. Core competencies include wireless miniaturized electronics design and prototype fabrication, research on coatings and polymeric materials, and on materials for electronics and energy conversion.

CNSE is a Defense Microelectronics Activity (DMEA, Department of Defense) Center of Excellence (COE) for design and prototype fabrication of micro-sensors and miniaturized wireless communication devices. CNSE is affiliated with state Centers of Excellence, including: Advanced Electronics Design and Manufacturing; Integrated Electronic Systems; Sensors, Communications and Control; and Surface Protection.

A characteristic of CNSE's research programs is the focus on the application and product deliverables. For example, prototype electronics can be routinely fabricated in quantity 1,000 units. Considerations for "manufacturability" and "productization" are part of much of CNSE's research.

The Center has several capabilities in electronics and materials research that are unique among US universities.

- CNSE's electronics-oriented facilities occupy 25,000 sf of Research 2, including 6,500 sf of Class 10,000 and Class 100 clean rooms, design and device testing laboratories, and an antenna design and test facility in the nearby NDSU Business & Technology Incubator. Equipment and prototyping tools are valued at nearly \$10MM. Technologies transferred from Alien Technology (Morgan Hill, Calif.) and Tessera Incorporated (San Jose, CA) are utilized in electronics packaging R&D. The Center also has an extensive research program in which students and faculty participate with staff researchers on studies of materials, design and manufacturing process innovations in the electronics area.
- NDSU's Combinatorial Materials Research Laboratory (CMRL) is also unique among U.S. universities. The CMRL and related labs occupy seven rooms totaling nearly 7,000 sf of Research 2. The CMRL combines robotic machines and software purchased from Symyx® Technologies, Inc. (Santa Clara, CA) with machines and equipment designed and built by the CNSE engineering team. Capital equipment in the CMRL is valued at more than \$12MM.



CNSE Partners—Government

- Air Force Research Laboratory
- Defense Advanced Research Projects Agency
- Defense Microelectronics Activities
- Office of Naval Research

CNSE Partners—Universities and Not-for-Profits

- Massachusetts Institute of Technology, Center for Bits and Atoms
- Rensselaer Polytechnic Institute
- Florida Institute of Technology
- University of Birmingham (UK)
- International Technology Center, Research Triangle Park

CNSE Partners—Corporate / Private

- Aldevron
- Alien Technology
- Bobcat Company
- Crane Wireless Monitoring Solutions
- Pedigree Technologies
- SatCon Technology Corporation
- Seashell Technology LLC
- Smiths Detection
- Superconductor Technologies, Inc.
- Symyx Technologies
- Tessera Technologies



¹⁷ Text and images from <http://www.ndsu.edu/cnse/>

Center for Computationally Assisted Science and Technology (CCAST)

The new CCAST website describes the Center as follows:¹⁸



The Center for Computationally Assisted Science and Technology (CCAST) is a research unit funded by the U.S. Department of Energy within the Office of the Vice President for Research, Creative Activities and Technology Transfer at North Dakota State University. The mission of CCAST is (1) to support NDSU research, (2) to spur technology-based economic development in the state of North Dakota using computational methods in areas of national and state priority including energy, transportation, precision agriculture, and biomedicine, (3) to support education and outreach activities to drive advanced computing into the mainstream, and (4) to develop a specialized high-end computing workforce in order to help preserve our nation's superiority in computational science.

We believe that computation—the third pillar, alongside theory and experimentation, of today's research and education enterprise – will progress to a leadership role in the near future. Consequently, our long-term vision for this Center is that it be the foremost hub in the Upper Midwest for those scientific and engineering endeavors which cannot rely on theory and experimentation alone.

At present, CCAST is the only advanced, high-performance computational center approved by North Dakota's Board of Higher Education. In addition to its on-site hardware, software, and filesystems, CCAST provides an on-ramp to national computing resources such as the Open Science Grid (OSG) and Extreme Science and Engineering Discovery Environment (XSEDE).

As most major research universities are expanding their capacities in *Big Data Analytics*, NDSU is fortunate to have CCAST in place as a significant resource for streamlining experimental workloads and for simulations that reduce experiment time. It is useful for modeling internal combustion engines, energy conversion, photo-voltaics, batteries, and other energy-related applications. Applications are in many other fields.

One interviewee's comment:

CCAST is respectable but not terribly impressive (yet). It will be the computational center for the region for a while and needs to be taken (by someone) to the next level of development.

CCAST was established as a model staffed with non-faculty personnel and operated outside traditional faculty activities. Today, NDSU's VPR is working to connect more NDSU faculty and NDSU research programs with CCAST.

¹⁸ Text and images from http://www.ccast.ndsu.edu/welcome/about_the_center

Related Entities

Two related corporations and a multi-state initiative / organization are part of the Research and Innovation structure of NDSU.

NDSU Research Foundation / Office of Technology Transfer

The NDSU Research Foundation, Inc. is an independent, not-for-profit corporation, established by the University to assist in protecting, adding value to, and commercializing intellectual property that is developed through University research activities. The Research Foundation is governed by a 13-person Board, including university senior administrators and members representing business and industry, including Agriculture, Software, Banking/Investments, and Manufacturing. Not surprisingly, the Research Foundation has been especially active in managing IP in Agriculture.

Currently, following recent budget cuts, there is one technology transfer officer.

Research and Technology Park

Among the organizational elements for *Research and Innovation*, the NDSU Research and Technology Park, Inc. (RTP) is an independent, not-for-profit corporation that oversees development and management of the NDSU Research and Technology Park (RTP). Its Board includes NDSU and external members. (The RTP is not discussed here, because it is the subject of its own Section 9, below.)

Northern Crops Institute

The website provides the following information:¹⁹

Northern Crops Institute (NCI) is a collaborative effort among North Dakota, Minnesota, Montana, and South Dakota to support the promotion and market development of crops grown in this four-state region. The NCI is an international meeting and learning center which brings together customers, commodity traders, technical experts, and processors for discussion, education, and technical services. Situated on the campus of North Dakota State University...this unique facility is only minutes from the farm fields which yield much of the world's food.

NCI short courses enable participants from around the world and across the US to learn about northern grown crops and their unique quality, marketing, and processing characteristics. The Northern Crops Institute provides technical services for the domestic and overseas markets. Equipment is available for developing products on a pilot scale. Staff members travel overseas to provide technical services regarding uses of northern grown crops.

(Proposed) Translational Research Foundation

Recently, there has been consideration given to creating a *translational research foundation*, to accommodate the need for an entity through which business / technology investments can be made. It is our understanding that this idea now has been abandoned, although the *function* of making technology investments is very much still a need and an objective.



¹⁹ NCI text and images from <http://www.northern-crops.com/aboutnci/aboutnci.htm>

Consultants' Observations

It would be difficult to conclude, based on the State's currently aggressive funding of its universities and current faculty workload data that strain on faculty time is *currently* a factor that would impede faculty members from undertaking research programs. It does seem that chronic underfunding (until recent years) could very definitely explain why NDSU:

- Did not grow into being a research university much earlier in its history
- Now is catching up with peers in other states
- Has deficits in staffing, facilities, and IT infrastructure to support its programs.

The Chapman era strategy, including focus on both significant overall institutional growth and use of external Centers with earmark funding to accelerate some of that growth, was successful. Among other things, the earmarks brought about the existence of CCAST and CNSE, both of which are extremely important to the University's research future. Ways must be found to reinforce the budgets for core personnel and facility assets of CCAST and CNSE, and to build on them for growth.

It now remains to use the currently enhanced funding level as a point of departure for a bold, new *Research and Innovation* strategy—one that is more difficult (because it will be more faculty-centric) but also more sustainable.

That said, the Phase 2 strategic considerations may require additional attention to the matter of faculty workloads, possibly with some strategic targets for overall faculty characteristics and perhaps different tracks and workloads for those faculty who are more oriented to instruction and those that are oriented to research. Support for graduate students and post-docs may need to be considered.

Overall, EKA concludes that the present staffing of the Office of the VPR is too small for current levels of activity and certainly will be too small for supporting and leading a future of significant *Research and Innovation* growth. An organization design and required staffing level might need to be incorporated into Phase 2 work. In addition, the problem of very little operating funding available to seed research should be addressed.

While a good business model for joint ventures with business (in varying forms) is needed, we believe it can be accomplished by expansion in and changes to the existing Research Foundation. Thus, if the decision has been made that there is no need for a new Translational Research Foundation, we concur in that conclusion.

8—ASSESSMENT: RESEARCH AND INNOVATION PERFORMANCE

This section provides baseline research and technology transfer data for NDSU planning for *Research and Innovation*.

NDSU Research Overview

The research data in Section 8 are based primarily on the National Science Foundation (NSF) 2012 or 2011 Higher Education Research and Development (HERD) Surveys.²⁰ Some additional data are from NDSU and from the Association of University Technology Managers (AUTM).

Long-Term Growth Trend and Current Ranks

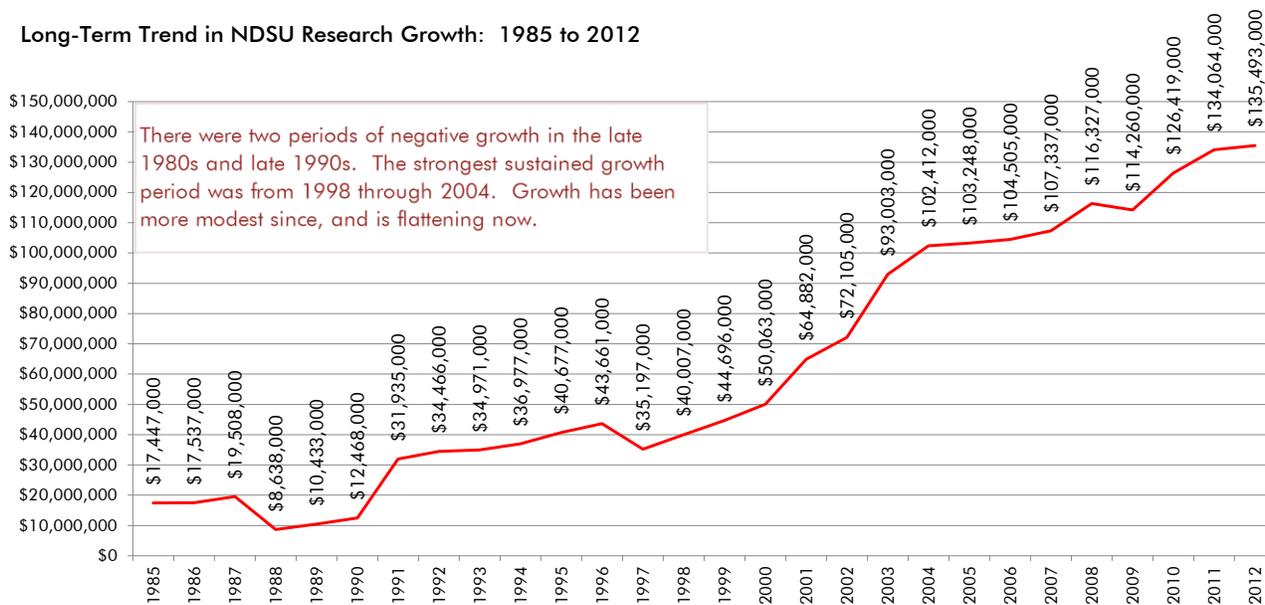
Three decades ago, NDSU produced \$17.5MM in research expenditures. NDSU’s research expenditures in 2012 (from all sources and in all fields) was reported at \$135.5MM, with well more than half, \$ 84.1MM or 62 percent, in Life Sciences, including Agriculture and Biosciences.²¹

The University now is one of 108 universities that the Carnegie Foundation classifies as *Research University / Very High Research*. In 2012, NDSU is ranked by NSF as 128th of *All Institutions* and 90th among public institutions. Among land-grants, NDSU now is ranked 15th among the 50 states in Agriculture research expenditures (up from 18th in 2011).

2011 or 2012 NSF Data

As noted in Section 6, due to timing, most of the NSF data in this report are 2011 NSF data. In a few cases, where we added additional analyses, we were able to use 2012 data.

Long-Term Trend in NDSU Research Growth: 1985 to 2012



It is evident that NDSU’s overall research performance has grown immensely since the 1980s, profoundly transforming the institution from a teaching-focused and largely regional institution, with land-grant functions, into a true land-grant research university.

²⁰ EKA originally created this analysis and these graphs using NSF 2011 data; we have just updated some, but not all the material, as the NSF 2012 data just appeared on NSF’s website in late March.

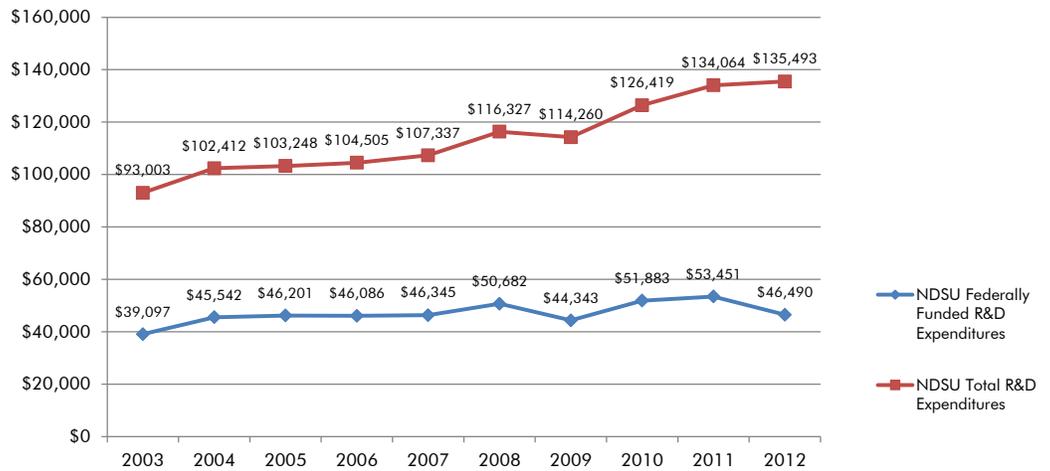
²¹ National Science Foundation, *HERD Survey*, Table 21. Higher education R&D expenditures, ranked by all R&D expenditures, by R&D field: FY 2012

Recent Trend—Total and Federally-Sponsored Research

In the 2003-2012 period, NDSU’s research expenditure growth was a total of 45.7 percent, while the total growth for *All Institutions* for that 10-year period was higher, at 58.6 percent.

NDSU’s federal R&D expenditures have been growing more slowly, compared to other institutions. NDSU’s federal R&D grew 18.9 percent between 2003 and 2012, while federal R&D expenditures by *All Institutions* included in the NSF HERD survey increased by 58.6 percent in the same time period.

NDSU Federal & Total R&D Expenditures, 2003-2012 (in \$000s)



Sources of Funding—Peer Comparison

We compared NDSU’s distribution of funding by source, using 2011 data, with:

- *All Institutions* (all universities, public and private, ranked by NSF)
- Averages for 15 institutions that NDSU has been using as peers; all are land-grants
- Averages for 9 institutions that EKA proposes as a new peer group; all are land-grants.

NDSU Research Funding by Source of Funds--Compared with All Institutions and Two Peer Groups, 2011 (in \$000s)							
Institution	All R&D expenditures	Federal government	State and local government	Institution funds	Business	Nonprofit organizations	All other sources
NDSU	\$134,064	\$53,451	\$43,721	\$31,206	\$577	\$1,070	\$4,039
		39.9%	32.6%	23.3%	0.4%	0.8%	3.0%
All institutions in NSF Ranks	\$65,073,411	\$40,764,823	\$3,819,470	\$12,444,705	\$3,162,464	\$3,840,381	\$1,041,568
		62.6%	5.9%	19.1%	4.9%	5.9%	1.6%
Average—15 NDSU OIRA Peers	\$167,905	\$91,553	\$15,964	\$49,209	\$6,819	\$3,585	\$775
		54.5%	9.5%	29.3%	4.1%	2.1%	0.5%
Average—9 EKA Suggested Peers	\$231,219	\$105,723	\$46,691	\$59,910	\$9,794	\$5,643	\$3,457
		45.7%	20.2%	25.9%	4.2%	2.4%	1.5%

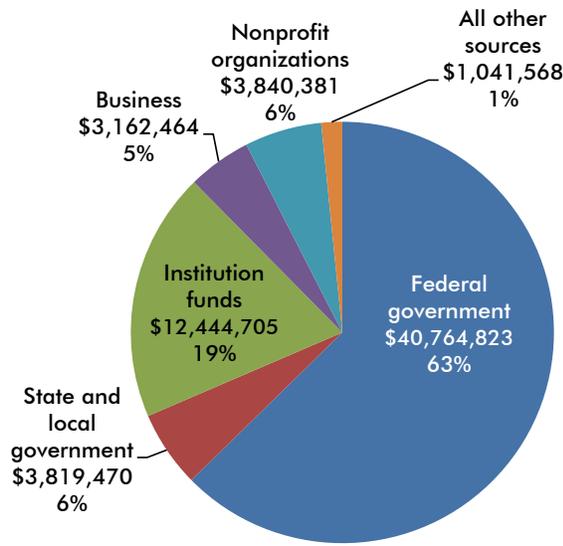
Source: EKA, from NSF HERD 2011, Table 14

- **Federal Funding.** For *All Institutions*, the percentage of federal funding to total is high, in part because all private institutions (not receiving much state funding) are included. As is typical, federal agencies collectively are the largest funding source of NDSU's research expenditures. However, NDSU's percentage of total funding from federal sources, at 40 percent, is lower than that for the two land-grant peer groups, at 55 and 46 percent, respectively.
- **State / Local Funding.** NDSU's state / local funding, at 33 percent of total funded expenditures, significantly exceeds the other three averages, although the average for the nine peers that EKA proposes is much closer, at 20 percent.
- **Institutional Funding.** The institutional funding that NDSU deploys, at 23 percent of total, is lower than the percentage of the two land-grant peer groups, at 29 percent and 26 percent, respectively.
- **Business Funding.** It appears that business / industry funding ranges from four percent for the two selected land-grant institution peer groups to five percent for *All Institutions*. In this comparison, NDSU is very significantly lower than all three comparison groups, at only half a percent. This provides evidence of NDSU's relatively underdeveloped business / industry R&D relationships; it represents an opportunity for future growth.

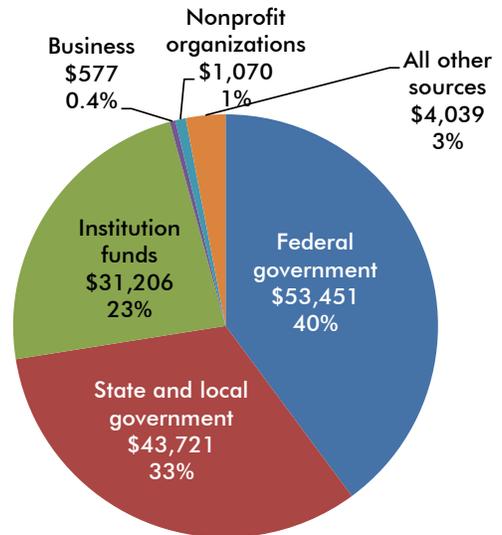
At present, state support is critically important to help NDSU's research and innovation growth, still in early stages. In the longer term, the percentage of federal, state, and business/industry funding should begin to look more similar to that of current and aspirational peers.

Comparison of Research Funding by Source—NDSU, All Institutions, and Two Peer Groups, 2011 (in \$000s)

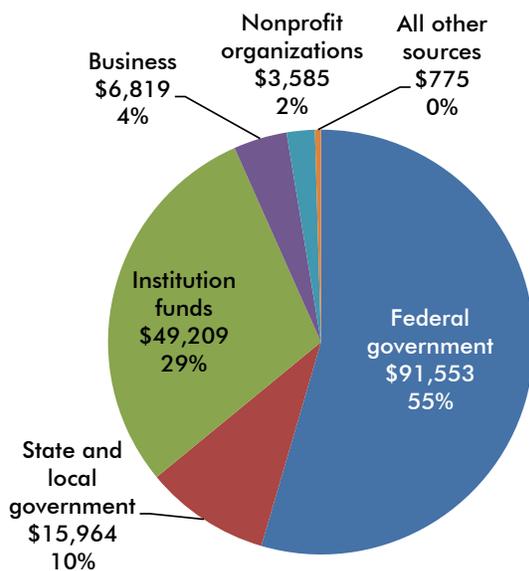
All Institutions Ranked by NSF



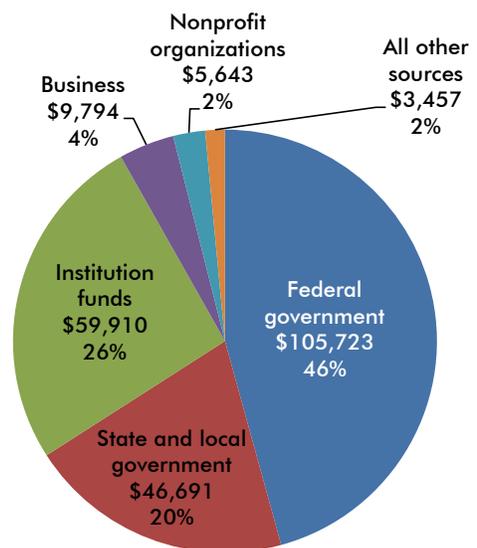
North Dakota State University



Average of 15 NDSU (OIRA) Peer Universities



Average of 9 Peer Universities (Proposed by EKA)

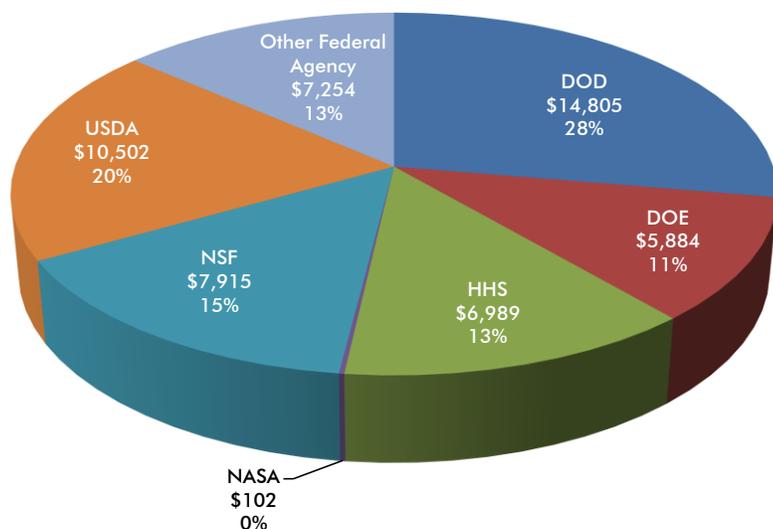


Distribution of Federal Funding by Agencies

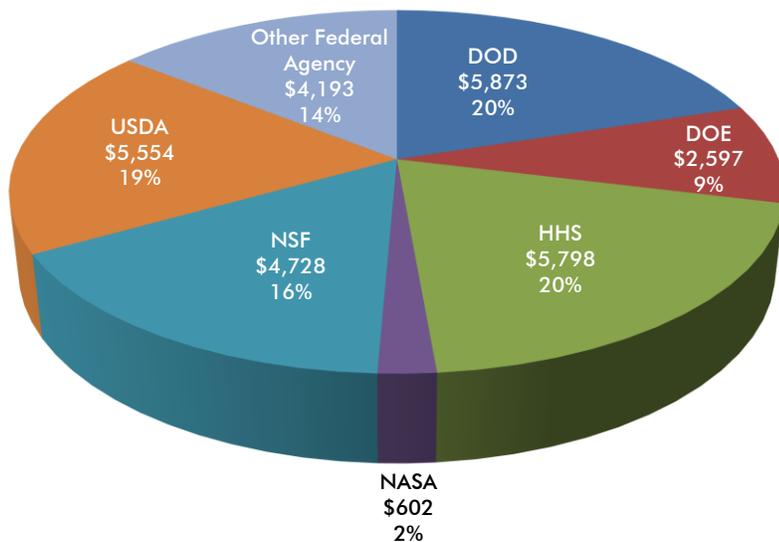
The Department of Defense (DOD) and US Department of Agriculture (USDA) are the federal agencies providing the largest percentages of NDSU’s federal funding. Earmark funding is via DOD or the Department of Energy (DOE). The Department of Health and Human Services (DHHS) funding includes two NIH Centers of Biomedical Research Excellence (COBRE) programs.

NDSU’s distribution by federal agency is fairly consistent with the 9-institution peer group for NSF, USDA, and Other Federal Agencies. NDSU’s share of its total R&D funding from DOD is noticeably higher than the peer group average, and the share of its total funding from DOE is slightly higher, with the portion of NDSU’s funding from HHS being notably smaller.

NDSU R&D Expenditures, by Federal Agency Source, 2011



Average R&D Expenditures by Federal Agency—9 Proposed Peers



Distribution of Funding by Disciplines

The next graphic is based on data supplied by NDSU’s Office of the VPR, providing a more granular view of funding by disciplines. It is not a surprise that Agricultural Sciences overwhelms all other disciplines. Four other areas, Nanoscale Science / Engineering (including CNSE) / Nano-Energy Materials; Transportation; Medical Sciences/Nursing; and Chemistry represent noticeable percentages. The other science and engineering disciplines are not generating significant contributions to overall research expenditures.

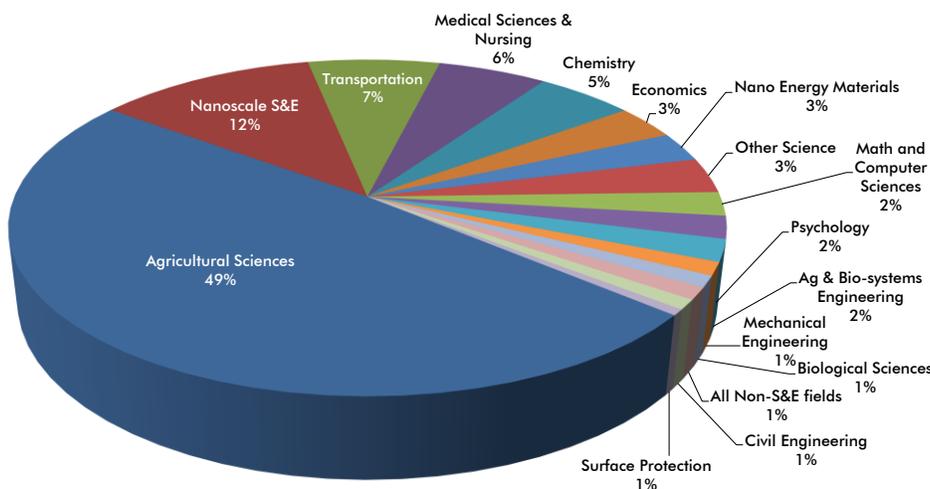
Agriculture Research Expenditures = 51 Percent of NDSU Total

This graphic distribution of research expenditures by discipline was compiled initially from NSF 2011 data (Table 29). However, we also obtained data directly from NDSU Office of Research to identify fields for what NSF showed as “Engineering—Not Elsewhere Classified.” That revealed additional research expenditures in Agriculture & BioSystems Engineering (ABEN), for which personnel compensation and all operating expenditures are funded / handled through The College of Agriculture, Food Systems, and Natural Resources.

EKA did not add the ABEN break-out to the NSF \$ distribution by fields, so as to not distort the NSF figures.

However, we call attention to the fact that, including ABEN, the total for Agriculture is 51 percent, not 49 percent.

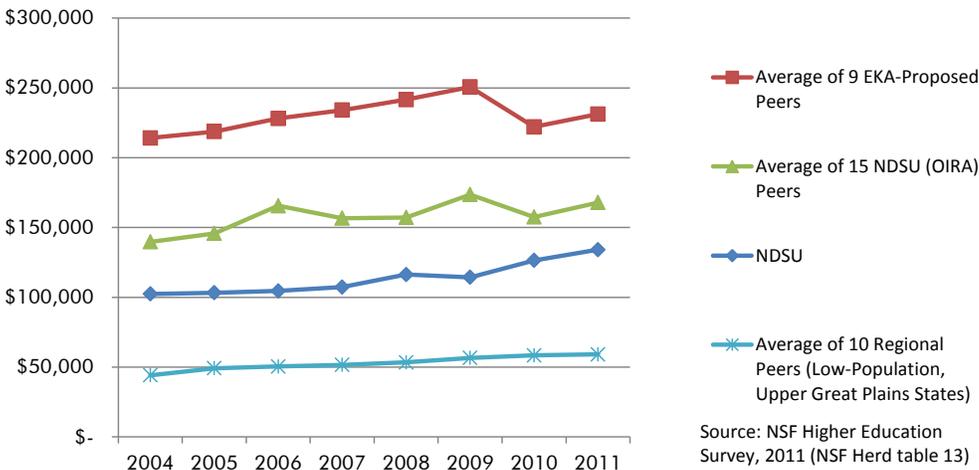
Total NDSU R&D Expenditures by Discipline, 2011



Research Performance Data—and Peer Institutions

The graph shows NDSU compared with the NDSU (OIRA) peer group, the Upper Great Plains institutions peer group, and the EKA-proposed peer group of nine institutions.

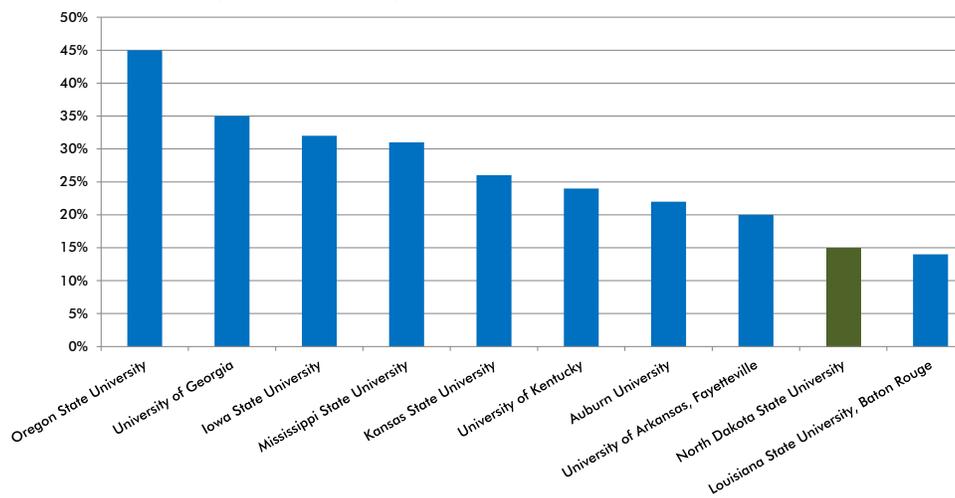
Comparison of Total R&D Expenditures—NDSU and Peer Groups, 2004-2011 (\$000s)



This comparison illustrates that the Upper Great Plains peer group is not useful for future planning/benchmarking purposes, as NDSU already exceeds the average R&D expenditure for this group. Both the 15-institution OIRA peer group and the 9-institution EKA-suggested peer group represent aspirational groups for planning *Research and Innovation* targets.

Using the nine peers that EKA proposes for a new peer group, NDSU is near the bottom of this group in the percentage of Agriculture research that is federally funded. Since NDSU is comparable to peers in the percentage of its funding (by federal agency) from USDA, it is possible that this result below is explained by the fact that NDSU receives significant research funding from State/Local sources.

Percentage of Agriculture R&D Expenditures from the Federal Government:
 NDSU vs. 9 Peers (Proposed by EKA)

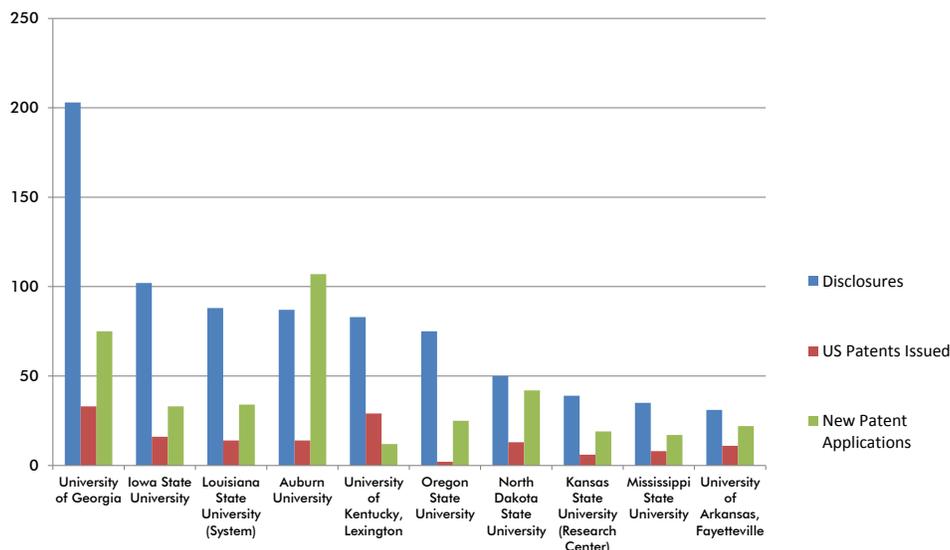


Technology Development Performance Data

Performance Statistics

The following are a few comparisons of NDSU performance in Technology Development with the nine peer institutions that EKA recommends for *Research and Innovation* strategy planning.²² Overall, NDSU lags several, but not all nine, of these peers in disclosures, patent applications, and US patents issued.

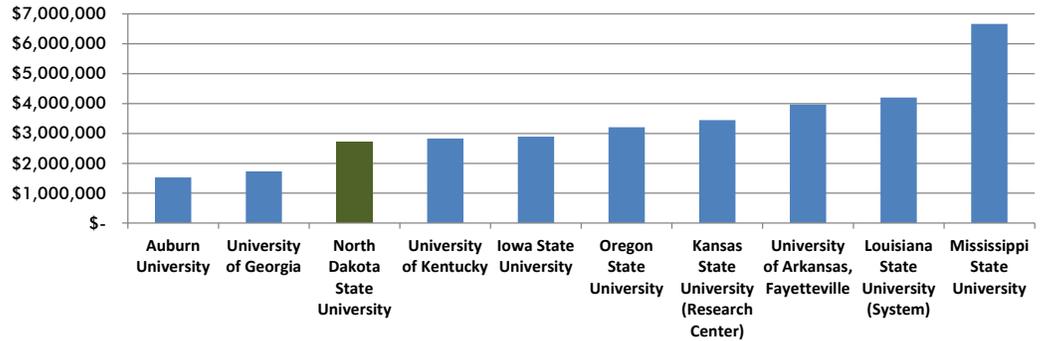
Disclosures and Patents:
 NDSU vs. 9 EKA-Proposed Peers



²² Data are from the Association of University Technology Managers Survey, 2012.

However, NDSU is unusually efficient in generating patents based on research expenditures, with one disclosure per each \$2.7MM in research. In this comparison group, only Auburn University and University of Georgia are more efficient, at \$1.5 MM and \$1.7MM, respectively.

**Research \$ Expended per Disclosure:
 NDSU vs. 9 EKA-Suggested Peers**



Factors in Research Performance: Resources, Policy, and Culture

Indirect Cost Recovery

Until recently, NDSU’s ICR pool generated from competitive grants was split as follows:

- 42 percent to the college in which the grant resides
- 42 percent to central administration / central budget
- 16 percent to the Office of Research.

Also, 100 percent of the ICR on earmark funds was administered by the Office of the VPR.

From its 16 percent and its 100 percent, the Office of the VPR covered the bond payments on Research I and II (via rent) and also had funds available for special investments/initiatives. Now that the earmark funds expended are much lower, so is the ICR on those projects.

Effectively, the VPR now has no funds available from this source with which to expand grant development support for faculty (which faculty and deans report has been entirely inadequate). Especially critical is that funds (and space) must be applied in order to seed multidisciplinary grant proposals. This is especially important at NDSU, in light of the silo and culture factors that need to be worked through, to prepare big grant applications.

Just to maintain the current total dollar level of research expenditures (and the current Carnegie designation) means that a large volume of formerly earmark-funded research must be replaced with research acquired in competitive grant programs and from industry R&D partnerships. This takes seed money.

Intellectual Property Policy Issues

Various interviewees commented that NDSU’s IP policies are such that companies often will not work on R&D collaborations with NDSU as a result. In addition, there are complex issues surrounding IP in cases where new work is developed by NDSU students: Apparently, this is not a problem if students are hired by companies as interns, but it is a thorny issue when students are working on NDSU research projects, with companies.

We have the impression that, while some of the IP issues are driven by state policy, some also are NDUS / NDSU policy. We also understand that there are differences in allocation of license revenues between the institution and the inventor(s) between UND and NDSU.

This entire matter was the subject of legislative hearings on January 22, 2014 and both UND's and NDSU's VPRs were among the presenters of information. This was pursuant to a request by State Senator Tony Grindberg that the Legislature review this issue. It is currently the subject of a major review.

We feel compelled to note that, while this is an important area in which clear and contemporary policies are needed, the protection and formal licensing of IP is, by far, not the only model of university-industry partnerships.

Culture Factors

For this discussion, we define culture to include factors of how decisions are made; what behaviors policy induces; and all elements of incentive and reward systems. The last also includes promotion/tenure practices. In a way, culture reflects what people understand about what the institution values.

The Matter of Silos in Strategy and Decision-Making

From medieval times, right up to the present, universities have operated in silos of disciplines. There have been advantages in this, to the development of knowledge in the disciplines. Academics are socialized early in their careers to be more attached to their discipline than to the institution(s) where they serve during their careers. In this issue, it may be a matter of degree for NDSU—and this surely is an issue for which comparisons are difficult. Based on many of the NDSU interviews and in the context of EKA's national practice, NDSU may have a more *active* silo culture than some other institutions, or NDSU has done less, thus far, to mitigate those silos than others have. Yet, this *evolution* (not *revolution*) is necessary, if NDSU is to tap faculty talent across disciplines for scaled up basic and applied research in major areas of need. For example:

- Several deans commented that they need "leadership" to create the right environment, including incentives that will help them reach programmatically across colleges. One senses from the collective interviews that most deans would want to do this (or more of it), but they may have a difficult time selling the idea to their faculties. That would explain their desire for (1) clearer top-down leadership messaging and (2) concrete incentives.
- We understand that NDSU has only eight (8) interdisciplinary degree programs at the graduate level. Further, these have very low enrollment and we are told that the departments see these programs as competing (for credit hours) with their disciplines. If this is an accurate representation of the extent of interdisciplinary programming in graduate education, then NDSU is not doing nearly as much in interdisciplinary programming as peers are doing.

Faculty Groups EKA Interviewed

It should be noted that our faculty group meetings were with those who are relatively more interested in research, partnerships, and outreach—the Distinguished Professors, NSF Career Awardees, and Center / Institute Directors.)

Promotion and Tenure Policies

This is a subject of great sensitivity in every university. It was a theme in several individual and group interviews for this *Research and Innovation Strategy*. For example:

- **From Teaching Institution to Research University.** Research is only recently a focus of NDSU, and some funding / performance has been via personnel who are not faculty. Therefore, it is reasonable to assume that the research culture within NDSU departments has not changed that much. The promotion / tenure culture still must be controlled mostly by senior faculty of *NDSU, the teaching institution*. It is not clear that evaluation of research / scholarship is done as it is in longer-established research universities.
- **Who Decides?** Curiously, some interviewees attributed control of promotion / tenure policy to the central administration: We have not had the opportunity to pursue this further, but we are quite skeptical. EKA has never encountered any other university where the basic decisions about who is promoted and who is tenured are made anywhere but in the departments, and yes, ratified typically by dean and provost. This actually is something that perhaps should change in the future, as more interdisciplinary hires are made, but we are not convinced by the comments, that, at present, the central administration has much policy control in this realm. This is an important issue that needs internal dialogue at NDSU.
- **A Culture Gap.** Some faculty interviewees described a “*toxic culture gap*” between faculty who pursue research and external activities and those who do not. We have no way to test validity of such assertions, but it is not hard to believe them—given rapid institutional growth, the specific manner of research growth, strong undergraduate focus, and a very traditional academic culture.

Consultants' Observations

The value of this 2011 / 2012 research snapshot is that it provides the point of departure for setting some growth targets in the new *Research and Innovation* strategy. In addition to setting overall / total growth targets for intermediate (e.g. 5 years) and longer (e.g. 10 years or more) time horizons, some specific targets could be set (a) by source of funding and (b) by disciplines (especially as these may relate to strategic, multidisciplinary priorities that also emerge from the planning dialogue). Faculty demographic targets also are possible.

A few other observations:

- **Interdisciplinary Programming.** Relative to other, more mature research universities, this young-ish research university has relatively little in interdisciplinary graduate programs and research.
- **VPR is Relatively New Position.** The University created the position of Vice President for Research, for the first time, in 2000—only about 15 years ago. Dr. Philip Boudjouk and Dr. Kelly Rusch are the only two persons to hold this position. Most other research universities have had this Office / Division for much longer. This is evidence that NDSU did not think of itself as a research university until about 2000.
- **Research Growth; Lagging Support Infrastructure.** Because much of the recent research growth was carried out in semi-external entities, CNSE and CCAST, the research infrastructure that one would expect to see in a university with \$135MM in research expenditures did not develop at NDSU. To succeed, NDSU requires more internal capacity to support research faculty in general, as well as to pursue selective / strategic and multidisciplinary priorities. We have not performed a detailed organization audit, but we believe that the Office of the VPR has functions / capabilities less elaborated than those in counterpart offices of peer universities. Faculty and deans feel that there is very little professional grant development support. An export controls position only recently was approved. IT systems are inadequate. Some documents still require circulation by hand for signatures.
- **Indirect Cost Recovery Sharing Formula.** While we did not perform a current survey of other institutions (and perhaps should in Phase 2), EKA surmises that the present ICR-sharing formula that returns 42 percent of ICR to the academic units is outside typical practice. While this policy may provide important budget flexibility to deans, it provides little means to incentivize larger, multi-disciplinary initiatives, which, in other institutions, are increasingly important strategies, and which would be supported at least in part from the Chief Research Officer's budget.

Now that operating resources of the colleges seem to be increasing, and because that trend will be augmented by the new state higher education funding formula, this may be an appropriate time to re-evaluate, and make adjustments to, the formula for internal distribution of ICR funds.

9—ASSESSMENT: RESEARCH AND TECHNOLOGY PARK

Overview

The NDSU Research and Technology Park (the Park or RTP) is a 55-acre site situated adjacent to NDSU’s Main Campus. It also is immediately adjacent to Hector International Airport, which serves the greater Fargo-Moorhead region. By virtue of its location, the Park provides a highly visible northern gateway to the university campus, as well as a welcoming *front door* to the community for arriving visitors.

As noted on its website, the Park is conceived to be a *“place where university researchers and private industry can combine their talents to develop new technologies, methods and systems.”* The first tenant moved to the Park in 2001, fulfilling a vision and plans that began in the early 1990s. The Park operates as a 501(c)(3) entity, whose 10-member board includes the university president, provost and VPRCA, in addition to private sector members.

Park tenants include well-established corporations, incubator start-up / young companies, and some NDSU research units and the Office of the VPR, all located in five buildings. (A sixth industrial building currently is vacant.) A commercial hotel property also is located in the Park in close proximity to the FARGODOME, a major regional destination. Under the 2008 *Master Plan* (JLG Architects / Sasaki), total build-out capacity is in the range of 750,000 to 1 million SF; build-out to date, at 418,000, is nearly half the mid-point of this range.

A centerpiece of the RTP today is its active incubator facility and program.

Founding and Early History

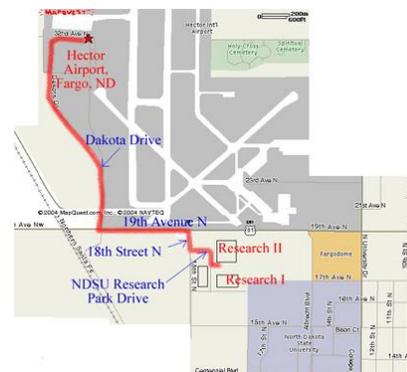
Genesis in University Goals of the 1990s

The concept for creating an NDSU-affiliated research park dates to 1993, first surfacing in conjunction with a *NDSU Facility Master Plan* that recommended reserving sites to accommodate university-related research and development, with a stated goal of fostering public private partnerships.

NDSU Presidents J.L. Ozburn (1988-95) and Thomas R. Plough (1995-98) advanced the planning discussions with support of City, County and regional utility interests, for the purpose of promoting economic development. By January 1999, work had begun on a feasibility study and preliminary business plan for the Park.

Rapid Pace of Early Development

After a six-year gestation, and upon arrival of new NDSU President Joseph A. Chapman in June 1999, the transition from drawing board to implementation moved quickly. By September, he outlined plans for the Park in his *State of the University* Address. That same month, a conceptual master plan and proposed strategic plan for the Park were approved by the State Board of Higher Education; the SBHE also authorized NDSU to move forward with establishment of a non-profit corporation and a master land lease to the operating entity. By year’s end, the corporation was operational and, by March 2000, a board of directors had been named.

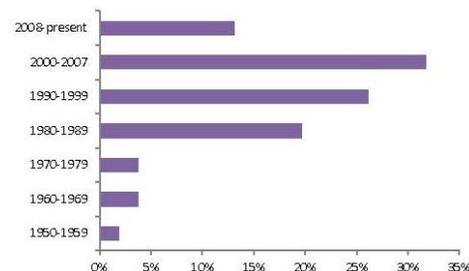


“Fifteen years ago all this was just a bunch of sunflower fields.”

Age / Stage of NDSU RTP

Using 2000 as the RTP’s founding date, RTP is among about one-third of North American research parks founded between 2000 and 2007. To compare its accomplishments with others, one would note that nearly 45 percent of parks are of similar age or younger, while 55 percent have been under development for a longer time.

Figure 9: Year Research Park was Established (Battelle AURP 2012 Survey)



In February 2000, a letter of intent also was signed with the Park's first tenant, North Dakota-founded Phoenix International (now a division of John Deere). Construction began in August 2000 and the company moved in by May, 2001.

Simultaneously, planning was started on the first of two buildings to house NDSU research activities; Research I was completed by February 2002, and Research II was dedicated in October 2004.

Additionally, at about the same time, an agreement was reached with Alien Technologies, a California company working on nano-scale RFID, to locate part of its operations in the Park. The building developed for Alien Technologies—which the company left after a short occupancy—was predicated on grants that were to go to the company, if it came to ND.

The 2000s

With the hiring of Mr. Tony Grindberg as the Park's first Executive Director in February 2002, and his subsequently hiring of Ms. Brenda Wyland to manage outreach activities, the RTP playing field widened to incorporate a distinct entrepreneurial agenda, reflecting their respective professional backgrounds and prior work in the economic development field.

The organization's first vision and mission statements were adopted by the Board of Directors in 2001. This was followed by a feasibility study for a Technology Incubator in 2003—just as construction of the Research II building was getting underway. Incubator planning efforts were complemented by a Center for Excellence Award from the State of North Dakota, as well as by a US Economic Development Administration *University Center* grant in 2004, which further strengthened the Park's capacity for strategic planning.

In 2006, construction began on the Park's Incubator, and the facility opened in 2007, with five companies as initial tenants.

The relatively long tenure of Mr. Grindberg and Ms. Wyland allowed the Park and Incubator operations to evolve under a sustained and consistent vision, one based on their efforts to adopt best industry practices. This was reflected in various operational and programmatic features of the organization, as well as by key studies and reports undertaken, described briefly in the following sections.

Now, Shift in Focus from the Chapman-Era Strategy

The character of the Park as it is today—with respect to both successes and challenges—was unambiguously shaped *initially* by strategies pursued by President Chapman that were designed to lift NDSU's standing as a research university. During his 10-year tenure, NDSU research expenditures rose significantly. Much of this involved success in garnering earmarks.

Then, since 2010, under Dr. Bresciani's leadership, the University has further advanced the research growth goal, and recently achieved the Carnegie designation of *Research University / Very High Research* designation.

To the extent that these goals were accomplished, the Park can legitimately claim a share of the credit for helping NDSU build its research enterprise. But while the earmarks strategy was consistent with the vision for rapidly promoting NDSU research and development, it did not especially favor activities to nurture the Park's entrepreneurial ecosystem, as it similarly did little to grow the internal faculty capabilities to perform competitive research.

Those elements indeed were added to the Park's agenda, but only later and over time, as the Park's professional management created an overlay of programs and initiatives that were entrepreneurially-focused.

NDSU's current leadership is working to address the legacy effects of the University's past reliance on earmarks as the dominant vector for growth of its research portfolio. Notably, the administration now is focused on capacity-building of the research infrastructure, and changing the faculty culture in ways that encourage the pursuit of competitive research grants, as well as industry partnerships.

In parallel, the Park's new management also faces its version of legacy issues—from the Park's physically-dispersed real estate development pattern, to the lack of connections between the earmark-funded university research and Park and incubator tenants. As a launch pad for the Park's development, the federal earmark strategy appears to have led a view of the Park's real estate as a means *to house the research* away from the campus, although, in turn, this research would boost NDSU's research expenditure levels and national standing.

This request for an Assessment represents a step in the process of repositioning the Park on a different set of foundations, based on the strengthening the entire *Research and Innovation ecosystem* in ways that should promote the Park's long-term sustainability. One of the major points of focus should be to more directly integrate the Park—programmatically and physically—with the University's *Research and Innovation* agenda.

Mission and Goals

Mission Statement

The NDSU Research and Technology Park operates to enhance the investments in North Dakota State University by the citizens of North Dakota. Through partnerships with international, national and regional centers of excellence, high technology-based businesses, and the research community at NDSU, the Research and Technology Park will achieve successful technology based development and broaden the economic base of North Dakota.

Scientific and technological advancement will be promoted through the development of facilities and research centers conducive to cutting edge research. The park will establish an innovation accelerator unit, which offers space, facilities and services to technology-based entrepreneurs and businesses.

Vision Statement

The NDSU Research and Technology Park serves as a catalyst for innovation in science and technology leading to discoveries that contribute to North Dakota's economic development.

Another, less formal and perhaps more dynamic representation of the RTP's purpose is contained in an advertising supplement published in 2012, through the *Fargo Forum*:

WE'RE CHANGING THE WAY FORGO MOORHEAD DOES BUSINESS.

We help entrepreneurs and start-ups in high-tech industries gain a foot-hold and move onto solid financial and operational ground. At the same time, we enable established companies to advance their research and development initiatives.

Benchmarks of Success to Date

Recent statistics of accomplishment EKA found were those that the Park reported in the October 2012 *Forum* advertising supplement:

- 893 on-sites jobs
- 511 indirect, offsite jobs
- \$57,000 / year average salary
- 60-70 percent of [company] revenues come from outside the state
- \$10.9 MM generated annually for local and state governments
- \$28.4 MM generated annually in non-labor income in North Dakota.

These data originally were documented in an *Economic Impact Study* independently conducted for the RTP in 2010 by Economic Modeling Specialists, Inc. of Moscow, Idaho.

Comprehensive Impact Analysis: 2010

Jobs:

Direct On-Site Jobs	893
Indirect Off-Site Jobs	551
NDSU Students	138
NDSU Graduates	286
Construction and Maintenance Jobs Since 2007	27
Labor Income Since 2007	\$8,000,000

Salaries:

Average Salaries per Year (in the Park)	\$57,000
Average Salaries per Year (outside the Park but in ND)	\$41,000
Park Industry Wages	\$51,000,000
Indirect Off-Site Wages	\$23,000,000

Property Income:

Park Industries and Off-Site but Linked Businesses	\$28,400,000
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Revenue for State, Local Governments:

State Government Revenues through Sales Tax, Personal and Corporate State Income Taxes and Other State Taxes, Charges, Fees and General Revenues	\$7,300,000
Local Government through Property Taxes, Other Taxes, Charges & Fees	\$3,600,000

Out of State Revenue:

Annual Revenues Originated from Outside of ND	65-70%
Out-of-State Revenues in 2010	\$101,000,000
Percentage of Growth Since 2007	59%

International Revenue:

Percentage of Revenues from International Inflows	8-10%
Revenues from International Sources	\$9,000,000
Projected Revenues from International Sources in 2011	\$17,000,000
Number of Countries	26
Continents	6

Grants and Related Cash Infusions:

Private and Other Grants, Venture Capital Fund and Angel Funds Since 2007	\$15,600,000
Projections for Grants and Related Cash Infusions in 2011	\$16,000,000
Percentage of Increase over 2007	410%

Economic Modeling Specialists Inc. examined the years 2007-10 and made projections for 2011.

From 25 years of the consultant team’s experience with new and maturing research parks, we can say with confidence that NDSU RTP has advanced to an extent much above the average for university research parks of similar age / maturity. Especially notable is the growth of several start-ups into mature companies that remain in the Park or in the region.

Despite confidence in the validity of our own judgment, based on our experience, we decided to also look, for corroboration, at recent data from the survey of the Association of University Research Parks (AURP). In the following table, it is clear that NDSU RTP statistics compare very favorably with average / typical statistics for North American research parks.

Comparison of NDSU RTP with Average North American Parks; 2012		
Typical Research Park		NDSU Research / Technology Park
Size	119 acres	55 acres (46 percent of average / median acreage)
	7 buildings open	7 buildings open; one vacant; potential users identified
	250,000 SF, 90% of space is currently occupied	418,000 SF
	25,000 SF incubator space	49,757 SF incubator (twice the average size)
Location	Located in a suburb	Located in small city
	Population of fewer than 500,000	MSA population ≈ 200,000
Governance	Operated by a university or a university-affiliated non-profit	Yes
Tenants	26 resident organizations	19 resident organizations (13 in Incubator; 4 NDSU units; 2 more large companies)
	64% for-profit companies	15 (including hotel) (75%)
	24% university facilities	4 university units (25%)
	4% government agencies	0 (0%)
Employment	Typical park employs 850	893 jobs on site (as of 2010)
	Major industries include software, aerospace/defense and biosciences	Manufacturing, Agribusiness, Educational Programming Software, Electronics, Biomaterials, and Other Life Science
Finances	Operating budget of less than \$1 million a year	Operating budget of \$1.1 million in 2013-14; slightly more in out years
	Revenue primarily from park operations, but also university, state, local and other sources	Revenues from ground leases, rents, fees, federal and state grants, and some gifts
	28% of parks reported generating less than 5% retained earnings, 34% of parks reported no retained earnings	N/A
Services	Provide a range of business and commercialization assistance services including:	
	Help accessing state and other public programs	Yes
	Linking to or providing sources of capital	Yes
	Business planning	Yes
	Marketing and sales strategy advice	Yes
	Access to subsidized space	Yes
	Technology and market assessments	Yes

Source: "Typical" park data from AURP 2012 Survey (Battelle); other data EKA from NDSU RTP sources

Governance and Management

The Park Board

As noted previously, the Park operates as a 501(c)(3) entity, whose 10-member board includes the university president, provost and VPRCA, in addition to private sector members. The Park's Executive Director is also a voting member of the board.

The Park entity operates with a five-person Executive Committee comprised of the board President, Vice President, Secretary-Treasurer, Assistant Secretary (currently open) and the Executive Director.

The Board has established policies contained in a formal *Operating Approval Schedule* (revised, October 1, 2013). The Schedule defines specific authority for key functions either by the Board as whole, by the Executive Committee, or by the Executive Director, or in combination (e.g. Executive Director recommends, Executive Committee recommends, Board approves; with budget / expenditure threshold levels etc.). Illustrative organizational functions covered by the Schedule include the following (partial list):

- Real and Person Property Approval for Expenditures
- Adoption of tax and accounting methods and policies
- Federal and State Income Tax Returns (and related items)
- Audit Report and Management Letters
- Annual Compliance Review; Safety, OSHA, EEOC et al. Compliances
- Operating Expenses
- Annual Operating Plan; Changes to Operating Approval Schedule
- Contracts; outside consulting services procurement; Insurance
- Banking and Investment Banking Relationships; Borrowing; Credit Limits
- Leases and Mortgages
- Contributions / Political Donations
- Travel Authorization
- Authorization / Signature Policy
- Personnel Policy & Administrative items (e.g. compensation; promotions; evaluations; personnel manual et al)

The existence of such policies and the detailed documentation speaks to the high level of professionalism and adherence to Best Practices for business, followed by the RTP.

The structure of the Board, which includes senior NDSU leadership (President, Provost, and VPR), along with senior business leaders, is a very good one.

Also, the fact that the Park's Executive Director is a member of the University President's Cabinet signals the President's intentions to align the University and RTP functions and priorities.

Incubator Advisory Board

The Technology Incubator is not separately incorporated, and thus operates essentially as a *program* of the RTP entity, under the auspices of the RTP's board of directors. However, its activities informally are overseen by a 13-member Incubator Advisory Board, which advises the RTP's Board about Incubator programs and operations. The Advisory Board includes a blend of individuals well suited to these purposes, including NDSU officials (Provost, VPR, Technology Transfer department) and outside business leaders—some of whom also serve on the RTP Board.

Advisory Board responsibilities include:

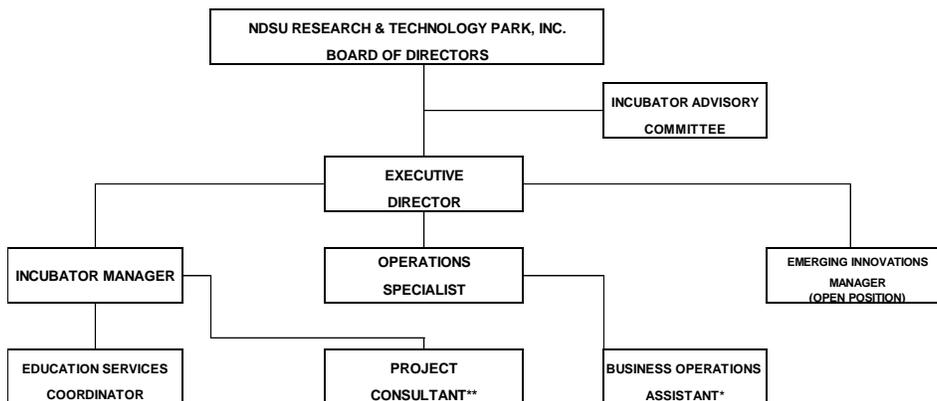
- Assist in the evaluation and selection of eligible incubator clients.
- Provide on-going support for the development of policies/procedures for incubator programs and facility operations.
- Market the Technology Incubator to stakeholders, business and community leaders, and client businesses.
- Support the Incubator Manager in establishing and managing a professional services network, coaching/mentoring program, and investor relations.
- Assist with business and community fundraising.
- Provide coaching and mentoring services as needed to incubator clients.
- Annual review of programming, benchmarks and accountability.

The Advisory Board thus doubles as one of the key service delivery arms of the Incubator, providing an outside resource for entrepreneurs through coaching and mentoring, and by linking incubator clients to the business community and NDSU.

Current Park and Incubator Staffing

RTP’s organization, including Board, Incubator Advisory Committee, and staff, is as follows.

**NDSU RESEARCH & TECHNOLOGY PARK, INC.
 ORGANIZATIONAL CHART**



*STUDENT POSITION
 **PART TIME POSITION

The RTP and Incubator today operate with a lean staff of four full-time and two part time employees. The recent transition of senior personnel (among reasons for this Assessment) means that the organization’s staffing today remains a work in progress. EKA has been provided with substantial documentation of Job Responsibilities and formal Job Descriptions for key positions.

The recent filling of the vacant Incubator Manager position with John Cosgriff, a seasoned business and entrepreneurial executive, has greatly strengthened the organization’s management and its service delivery capabilities in perhaps its most key area.

There is a general sense that the staff is spread very thin, while it nonetheless continues to cover all the organization’s main functions. This includes a lead role in carrying out major events such as *Innovation Week*; accommodating the day-to-day needs of new and existing tenants; and strategic leadership (with NDSU) of various aspects of the overall innovation enterprise and the regional entrepreneurial eco-system. Probably the most evident staffing gap is in the area of marketing and communications.

Development and Occupancy Summary

NDSU Research & Technology Park Facilities: Development to Date (as of May 2014)		
Building	Acres	SF
Research I	2.1	40,000
Research IA	0	35,000
Research II	3.8	77,000
Phoenix / Deere	6.5	75,000
Incubator	2.9	50,000
Alien	4.1	50,000
Appareo	2.5	40,000
Candlewood Hotel / Suites	2.6	50,970
Total Development to Date	24.5	417,970
SF per Acre		17,060
Hotel is planning an 18-unit expansion. Appareo is planning expansion.		
Source: NDSU RTP		

Acres and building metrics for development to date are shown in the adjacent table. The development accomplishments are impressive.

Even more meaningful measures of a research park’s success are reflected by its occupancy mix and the individual prospects of occupants for success. On these measures, also, RTP has done well. In the RTP, companies and entities of various life-cycle stage and size, large and small, established and start-up, make up the economic and intellectual activity. Park / Incubator tenancy also is diverse by field of endeavor. The companies range from manufacturing of off-road vehicles and other industrial products, to agribusiness, educational programming software, electronics, biomaterials, and life science.

Major Tenants

At present, three Park tenants occupy single-user buildings: These are John Deere Electronic Solutions; Appareo Systems (Batcheller Technology Center); and the Candlewood Suites Hotel. Interestingly, the John Deere operations and Appareo Systems share a common founder: Barry Batcheller, a highly successful Fargo entrepreneur who also is an RTP Board member.



The John Deere company presence began as Phoenix International, founded by Mr. Batcheller and developed into a significant Fargo-headquartered business (1,000+ employees), that eventually was sold to John Deere. In this respect, the enterprise is both entrepreneurial in origin, and yet today part of a global agribusiness giant. The core competencies at the Deere operations align primarily with NDSU’s strengths in engineering, while its industry sector reflects NDSU’s traditional focus on advancing agriculture and agricultural research.

Appareo Systems was launched as an incubator tenant, first housed at the Research I building, before the current incubator was completed. It then reached a threshold where it could build its own free-standing building in the Park. The company now contemplates further expansion, as it builds partnerships with leading aerospace and agriculture companies.

In the world of research parks, the Phoenix / Deere and Appareo stories represent success in every respect, with outcomes that parks everywhere are seeking to achieve. In a short period of time, the NDSU RTP has shown that it can combine entrepreneurial talent from the region with incubator support at the right time and in the right way, and yield companies with an ability to forge corporate partnerships on a global scale.

Candlewood Suites provides nearby hotel options.

Research I and II Buildings—NDSU

Although some space is currently unassigned, the Research I and II buildings represent a significant NDSU and research and research administration presence on the Park campus:

- NDSU Office of Vice President for Research and Creative Activity
- NDSU Research Foundation
- NDSU Department of Coatings and Polymeric Materials
- NDSU Center for Nanoscale Sciences and Engineering
- NDSU Center for Computationally-Assisted Science and Technology.

Incubator Tenants

Current Tenants

The Technology Incubator opened in 2007 with five tenants. Today, in addition to the RTP management team, the Incubator houses 12 entities, including the following:

■ Bobcat (Doosan, Korea)	■ HCQ Biosciences, Inc. (from NDSU)
■ Bolder Thinking (from region)	■ Larada Sciences (from region)
■ C2Renew (from NDSU)	■ Renuvix (from NDSU)
■ Ergologistics LLC (from region)	■ RFID Lab (NDSU unit)
■ Cargill Feed Management Systems (from region)	■ Triton Systems (from region)
■ Genosys (from region)	■ WoWiWe (from NDSU)
	■ Medytex (joined April 1, 2014)

In addition, the Fargo Moorhead Angel Investment Fund uses the Incubator as its location, although it does not lease space.

Descriptions of most of these companies or organizations can be found on the RTP website.

<http://www.ndsuresearchpark.com/Tenants/Pages/default.aspx>.

Of note, seven current tenants, including the recently added Medytex, were founded by entrepreneurs from the surrounding region, versus four that are the result of inventions or initiatives by NDSU personnel. This is a ratio EKA finds typically, mirroring the experience of most incubators with which we are familiar. Interestingly, one of the Incubator’s newest additions, HCQ Biosciences, was founded by a recently graduated PhD from the College of Pharmacy, Nursing and Allied Sciences.

The **Fargo Moorhead Angel Investment Fund** is a service provider for whom the Incubator building is the legal address; the RTP has a management contract to provide services for the fund. The Fund seeks equity investment opportunities in early to mid-stage private companies in the manufacturing, software or related technology sectors that have high growth potential with direct ties to North Dakota and Minnesota. According to RTP staff, the Fund has loaned all its money and is not undertaking any new investment activity.

The **RFID Lab** is business unit of NDSU’s Center for Nanoscale Science and Engineering, located in the Incubator building in order to meet its technical requirements. For more information on its activities, see:

http://www.ndsu.edu/fileadmin/caedm/RWSLfactsheet_Technical_4-4-08.pdf

Pending New Tenants

Two more companies are pending for the Incubator—both with NDSU faculty involved:

- One has developed a slow release nitrogen fertilizer technology using corn based materials. This company has been accepted into the Incubator program; however, it has not joined yet. The main contact is an NDSU professor.
- In late April, the Advisory Committee reviewed and approved another company for acceptance into the program. The company is working on reducing the size and thickness of RFID inlays. The team consists of an NDSU Professor of Industrial and Manufacturing Engineering, along with two other business people from Massachusetts.

Research Park Documentation (2007-2009 illustrative)

Internal RTP reports summarize tenant metrics:

- Employees (F, PT); at time of entering and current
- Dollar amount of salaries and wages (monthly)
- Gross revenues for most recent year
- Number of students employed
- Internships
- University graduates employed
- Dollar amount of debt capital, current year
- Dollar amount of equity capital, most recent full year
- Dollar amount of grant funds (SBIR, State programs, etc.) for most recent full year

The Technology Incubator

Because RTP leadership paused to conduct this *Assessment* and strategic planning for the future, some information below, from source documents, may be dated.

Incubator Facility Features

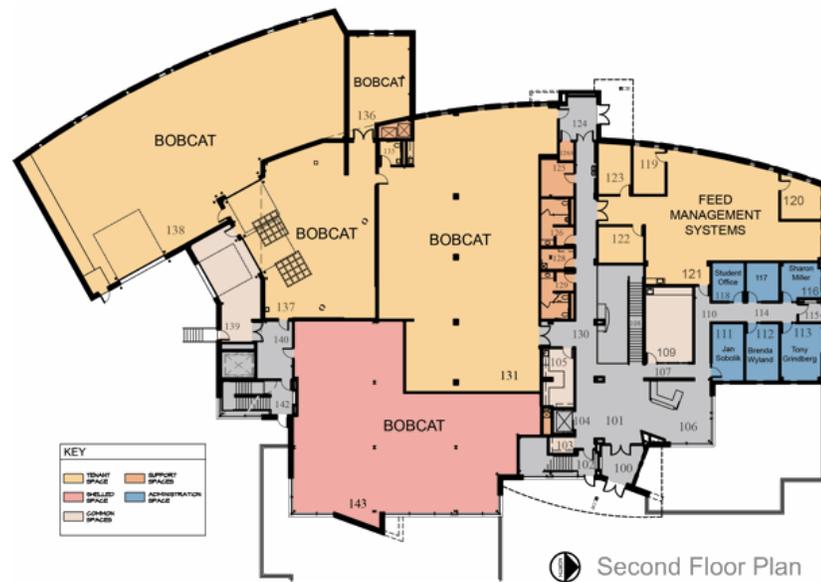
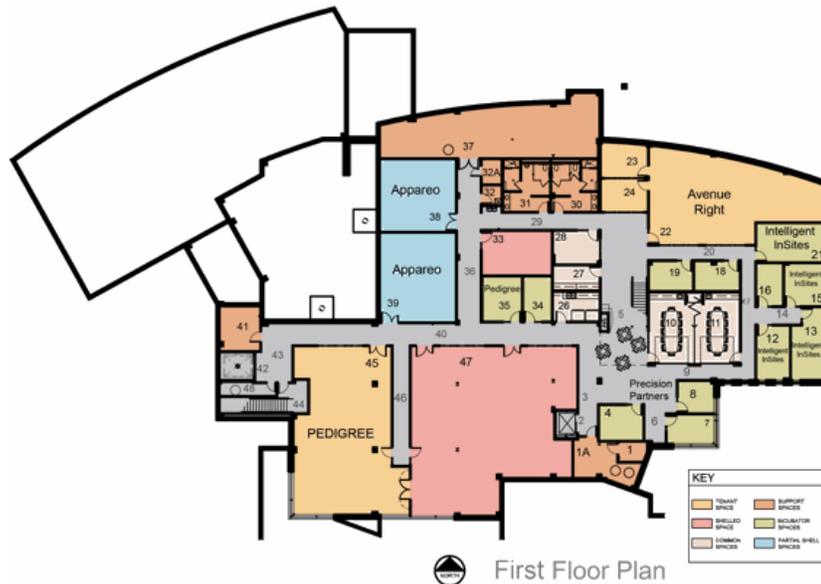
As noted elsewhere, the 50,000 SF Incubator facility is twice the size of the *typical* incubator in North American research parks. It is, however, a quite typical size for multi-tenant office/lab facilities, which often are in the range of 50,000 SF.

This Incubator offers several space types for lease, and shared amenities / spaces.

■ Wet Lab / Dry Lab Space	■ Executive Boardroom & Conference Rooms
■ Manufacturing Space	■ Common Reception Area
■ Customizable Tenant Space	■ T1 Lines, Dedicated Data Rooms & Phone Systems
■ Shared Production Areas	

Incubator Floor Plans

The incubator floor plans are shown to provide a sense of the scale and nature of the facilities. Some of the occupant data is no longer current.



Admission Criteria and Process

Businesses are not automatically accepted into the Incubator facility merely on the basis of an ability to pay rent. In recruiting businesses, the RTP emphasizes its interest in specific industry sectors correlated broadly with areas of NDSU research strength and priority:

- Biosciences
- Material Sciences
- Information Technology
- Advanced Manufacturing

Interested companies are asked to submit an *Executive Summary of their Business*, with a brief description of the business, product(s), market, financials goals and management. A preliminary assessment is made by the Park's Incubator Manager, based on an informal meeting. If a potential fit with the Incubator goals is determined, then the formal application process begins, including submission of a business plan. This is followed by a Panel Interview with the Incubator Manager, Incubator Advisory Board members, and / or specially-recruited industry specialists. The Advisory Board makes a decision regarding acceptance into the program and recommends an appropriate length of occupancy. The decision to admit a company is based on formal *Evaluation Criteria*:

- Must be a start-up, or new division of an existing company, focused on innovation and commercialization of new products in a primary sector business
- Business concepts and goals that are well defined, technology based, and aligned with the objectives of the Technology Incubator, NDSU Research & Technology Park, and North Dakota State University, and within one of the technology sectors supported by the Technology Incubator
- Must have a product or product concept, and not be in pure research mode
- Present a management team capable of handling the technical aspects of the business or demonstrate ability to obtain needed technical assistance
- A product, technology, or service that can benefit from the value-added services provided by Technology Incubator, Advisory Board, Coaches/Mentors, and the business network
- Future ability to graduate from the incubator and become a successful part of the business community, with demonstrated potential for business growth and job creation.
- Ability to pay rent while working towards an equity investment and/or developing a positive cash flow that will allow the business to sustain operations over time.
- Not be in direct competition with another start-up already located in the Incubator.

The existence of a clear set of admission criteria, coupled with a rigorous review process carried out by staff and members of the Advisory Board, may be considered a strength. That said, it may be useful to review these criteria for possible changes, in Phase 2.

Incubator Outcomes

Incubator Graduates in the Fargo Area

Four companies have graduated from the Incubator and are continuing to prosper and experience rapid growth in the Fargo metropolitan area. One of these, Appareo, remained in the Park as it was able to build its own building. Data on current employment levels was only available through 2009, but stakeholder interviews held with each of these confirms that they have received significant outside investment capital and are achieving sales levels and industry partnerships to further propel their growth.

- **Intelligent Insites:** This company is a developer of real-time location, communication, and workflow solutions for the health care market. Founded in 2003, Intelligent InSites designed a method to track patients, residents, staff, equipment and inventory within a hospital or long-term care facility. *Graduated, February 2009*
- **Appareo:** This company develops solutions that build on innovation in augmented reality and advanced electronics. The company employs experts in embedded hardware and software, networking, advanced graphics, and large-scale computing platforms. *Graduated, October 2009*
- **Pedigree:** This company is a leader in the field of intelligent asset management systems. The company's *Lineage Services Platform*, an advanced software and hardware system, unites wireless and embedded sensor networking technologies with the World Wide Web. It enables organizations to deliver remote, real-time product performance information, as well as post-sale support and response for serviceable machinery and equipment, from anywhere in the world. *Graduated, October 2009*
- **Myriad Devices:** This company was founded by two NDSU electrical and computer engineering (ECE) professors, along with a former ECE professor and a local business owner. The initial development and market focus for Myriad Devices is a unique advertising service, two wireless media products, an exercise assist device, and an ad-hoc wireless network for sensing, automation and control. *Graduated, August 2012*

Companies in Growth Stages

Three companies provide examples of young companies that have transitioned to being divisions of established corporations but, for the moment, remain in the incubator:

- Feed Management Systems, recently acquired by Cargill
- Bolder Thinking, recently acquired by Astute
- Ergologistics, recently acquired by Southworth.

The Incubator Building as a Multi-tenant Facility

EKA notes that NDSU's Incubator operates, in part, as a multi-tenant building. The mix of companies within the RTP Incubator today thus represents a mix of true start-ups (university-born or community-born) with young gazelles and mature / established companies. The potential for interaction among them is ideal at NDSU's incubator facility. Except to the extent that public funding makes it difficult to do, the model of incubator buildings with rigid occupancy criteria is giving way to models in which the users / occupancy can be more flexible. Incubator programming (and pricing) can be provided to incubator companies, but space also can be provided for rapidly growing incubator tenants, incubator graduates, or established firms seeking a high visibility presence within a research park.

To this end, NDSU's Incubator facility already meets this test and provides a perfect opportunity for established multi-national companies such as Bobcat to interact with start-ups, which may provide mutual business opportunities. Rather than seeking to segregate incubator space from buildings to house established tenants, a desirable model may be to replicate the functionality of this Incubator in development of future multi-tenant facilities.

Park / Incubator Tenant Services

Overview

The following services are available to Incubator and Park tenants:

■ Client Networking	■ Student Employee Program
■ Coaching and Mentoring	■ Comprehensive Business Assistance
■ Market Research	■ Educational Events and Forums
■ University Relationships / Linkages	■ Entrepreneurship Education
■ Help with Access to Financing / Venture Capital	■ Access to Professional Services

Additional Resources Specific to North Dakota

Services available through the State of North Dakota are described in an internal tenant publication, *NDSU Technology Incubator: North Dakota Programs*. RTP staff assists companies in gaining access to North Dakota-based programs (including access to capital and incentives). Listed state and regional / other resources include the following.

State Resources	
<ul style="list-style-type: none"> ■ ND Department of Commerce Programs <ul style="list-style-type: none"> • Operation Intern • ND Development Fund • Innovate ND • Agricultural Products Utilization Commission (APUC) • Venture Capital Program • Technology-Based Economic Grants (TBEG) 	<ul style="list-style-type: none"> ■ Tax Incentives <ul style="list-style-type: none"> • Income Tax Exemption • Angel Fund Investment Tax Credit • Internship Employment Credit • Development Tax Credit • Sales Tax Exemption • Computer / Telecommunications Equipment • Wage and Salary Credit • North Dakota Seed Tax Credit
<ul style="list-style-type: none"> ■ North Dakota Job Service <ul style="list-style-type: none"> • New Jobs Training Program • Workforce 20/20 	<ul style="list-style-type: none"> ■ Bank of North Dakota <ul style="list-style-type: none"> • Business Development Loan Program • Beginning Entrepreneur Loan Guarantee Program • Business Incentive Programs (PACE; MATCH)
Regional / Other Resources	
<ul style="list-style-type: none"> ■ Fargo-Moorhead Angel Investment Fund 	<ul style="list-style-type: none"> ■ Fargo-Moorhead Economic Development Corporation
<ul style="list-style-type: none"> ■ Arthur Ventures Growth Fund, LLC 	<ul style="list-style-type: none"> ■ Dakota Certified Development Corporation <ul style="list-style-type: none"> • SBA 504 Loan Program • Intermediary Relending Program • Main Street Loan Program
<ul style="list-style-type: none"> ■ InvestAmerica Venture Group 	
<ul style="list-style-type: none"> ■ Linn Grove Ventures 	

The Bank of North Dakota, the only state-owned bank in the Nation, was created to promote and encourage agriculture, commerce and industry in North Dakota. The Bank of North Dakota serves as a funding resource in partnership with other financial institutions, economic development groups and guaranty agencies.

The North Dakota Development Fund (under the Department of Commerce) provides gap financing through loans and equity investments not available from most conventional lenders and is available to any primary-sector business with the exception of production agriculture. The Development Fund also administers the Regional Rural Revolving Loan Fund, which provides funding for primary-sector projects located in a community of less than 8,000 in population or located more than five miles outside the city limits.

Incubator Client Activity, as Indicator of Services Received

Park staff provided EKA with a series of prior year internal reports that document specific services received by individual Incubator building tenants (including established firms, such as Bobcat). These documents provide only *lists* of services; or in some cases, they indicate merely that the firm participated in a program or event. Therefore, we do not infer any qualitative judgment as to the value of these services to the respective tenants. Nonetheless, they provide another perspective validating the service delivery capabilities of the Incubator, as part of a composite picture of the activities taking place at the Park and in the Incubator.

Each company participated in a customized mix of program or service offerings. The reports identify these under broad service categories or program names. Please see Exhibit 8 for the detailed list.

Student Employee Program

In an effort to assist with current and future workforce challenges, the Incubator implemented a *Student Employee Program* whereby students awarded an Entrepreneurial Scholarship are engaged with entrepreneurs in the incubator. Students who work for incubator companies for 40 hours per semester are paid for half the hours plus they receive a \$2,000 scholarship. This Program provides students who may be interested in launching their own entrepreneurial venture with hands-on experience working for a start-up company. In addition, tenants located in the Incubator benefit from the work conducted by the students and are provided with the opportunity to access top talent from the University to meet current and future workforce needs.

Innovation Week / Innovation Challenge

The RTP holds various educational and networking events to promote development of the entrepreneurial culture at NDSU and in the region. The showcase event is *Innovation Week*, now in its fifth year and run as a partnership between the NDSU Office of the Provost and RTP, with RTP is the administering entity. (Exhibit 9 provides more program details.)

The purpose of *Innovation Week* is to:

- Encourage students to be innovative thinkers
- Enhance student awareness for innovation as a precursor to entrepreneurship
- Empower students to pursue entrepreneurship as a career choice
- Expand student access to resources available for innovators and entrepreneurs
- Engage the current entrepreneur and business communities with students

The 2013 Grand Prize winner is a tenant currently in the Technology Incubator, and working with community leaders in the field to move its product towards commercialization.

Innovation Week 2014 took place March 3-7. Park staff provided EKA with an internal assessment that notes challenges to sustaining the program's momentum and impact:

Despite increased efforts to promote Innovation Challenge in classrooms and throughout the year, the lower team entries in Innovation Challenge '14 is concerning to the steering committee. Increasing student participation at all Innovation Week events has proved to be very challenging, yet continues to be a top priority for 2015....In conclusion, the Steering Committee, Provost, and the NDSU Research & Technology Park staff...have a vested interest in the continual growth of the Innovation Week program. We look forward to an ongoing



relationship with the ND Corn Council as we work to promote and enhance an innovative culture throughout the NDSU Campus.

Park Marketing and Communications

Sponsorships

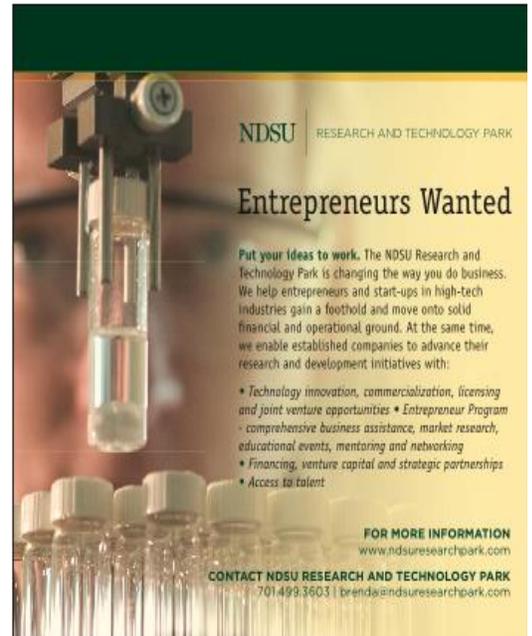
Park management noted that its primary vehicle for raising awareness about the Park and Incubator comes via sponsorship of events or programs being held throughout the region by other organizations. There is limited advertising. Data provided for the 2013 year showed a modest expenditure of some \$13,000 in sponsorships across the following activities:

- Midwest Mobile Summit
- Startup Weekend
- Chamber Choice Awards – Entrepreneur of the Year
- Family HealthCare Health Pitch
- Chamber State of Technology event
- Red River Valley Research Corridor, Small Business Innovations Summit
- Junior Achievement
- Dakota Manufacturing Extension Program, Business Growth Summit
- Ag Tech Expo (ad purchase)
- Additional ads in *Prairie Business Magazine* (ND/SD/MN coverage).

Communications

Main vehicles for communications include the following:

- **Annual Reports:** The Park website serves as a repository for many of the organization’s communications tools, including Annual Reports. The website currently shows these documents for the years 2005-2006 through the 2009-2010 period. It is not clear to EKA if formal Annual Reports have been produced for subsequent years.
- **The Edge:** An annual report-type advertising supplement to the Forum newspaper, the website indicates that five editions of this attractive and informative publication have produced, most recently in October 2012.
- **Press Releases:** The web site carries an inventory of news announcements dating from 1998; however none have been posted on the website since 2012.
- **News Articles about Park / Incubator Subjects:** This inventory goes back to the Park’s May, 2000 groundbreaking. It includes some current coverage from 2013, although no articles during 2012.
- **Newsletters:** The Technology Incubator staff produced an informative, well-formatted electronic newsletter on a periodic basis, averaging six issues per year (sometimes more), from 2003 through the 2012 year.



Illustrative advertisement placed in *Prairie Business*, a magazine with exposure in North and South Dakota, as well as Northwest Minnesota.

E-News Update



Park Finances

Operating Budget

RTP management provided EKA access to key financial documents, including 2013 audited financials, a detailed operating budget, and other in-house sources of financial information (e.g. tenant and ground lease income).

The RTP Board's most recent *Five Year Financial Projections* show a total annual operating budget in excess of \$1.1MM for 2013-14, increasing to \$1.3MM and \$1.2MM in outlying years. The operating budget is structured around four sub-budgets covering four areas of activity:

- Incubator Operations
- Research I and Research II
- Education
- RTP Administration.

Operating Revenues

Operating revenues have been primarily realized through a combination of: ground lease income from the Park's private company tenants; net proceeds from leases with NDSU for the Research I and II buildings; rental and service fees at the Incubator building; plus additional state and federal grant sources. A budget category for *Education* covers the *Innovation Week / Challenge* program, with additional grant and sponsor income dedicated to that activity.

RTP has operating revenues from ground leases and building rents. Revenue from the six buildings currently is \$400,000 per year. While this amount forms only a part of total revenues, the Park's ability to generate additional income from future development will be a factor in its future financial plan. Focus on multi-tenant buildings vs. company-owned facilities, and the future *development density* will be factors in ground lease vs. building income.

Operating Expenditures

The most significant categories of expenditure are Incubator Operations and RTP *General and Administration* (G&A). Together these represent \$930,000+ of the approximate \$1.1MM 2013-14 operating budget, and cover the core of staff and direct Incubator and Park operating functions. The category *Education* (Innovation Week) is an approximate break-even cost in the range of \$115,000. Additional expenditure categories cover special debt repayment and assessment obligations. Expenditures for debt service of the Research I and II buildings are shown within the sub-budget for these properties, and appear as a net figure in the Combined Statement.

The operating budget shows an excess of expenditures over income of approximately \$145,000 for 2013-14 and increasing in the years going forward. This reflects the end of a previous grant cycle of US EDA funds, matched by ND Department of Commerce funds. This gap, beginning in 2013-14, will be in part or wholly addressed by a new 5-year cycle of EDA funding (and matching North Dakota funds) that is not yet reflected in the budget. The new EDA funding will involve new expenses as well, the details of which are currently being addressed. Additional operating revenues needed in the future are expected to come from several sources: additional land leases; raising rents on existing buildings; and repurposing of the Alien Building.

Incubator Operations Funding

A longer-term issue brought to EKA's attention by the Park management concerns the cost of running Incubator operations and the net deficit of this activity. It is well-understood that rents from incubator tenants cannot (and probably, should not) be looked to as a way to finance incubator staffing / program operations on a break-even or net profit basis. Indeed, the general weight of tenant feedback, plus EKA's observations and experience, suggests that, if anything, incubator services should become even more robust, and certainly should not be reduced. This is an important question to be addressed within the framework of the overall strategic plan, as that is developed in the coming months.

"We've been trying to ask who should pay for the incubation of companies in Fargo? Should the State pay to incubate businesses? Should it be the City of Fargo, local Economic Development, NDSU, or the RTP?"

We have not been able to answer that question."

Park stakeholder interview

Shared Services and Efficiencies

The ability to coordinate and share services with the University contributes to the ability of the Park organization to operate successfully in this lean fashion. With respect to various nuts-and-bolts aspects of Park operations, EKA interviews and email exchanges with RTP staff identified the following:

- NDSU provides landscaping / mowing service in summer (at cost)
- Park hires contractors for snow removal, internal building cleaning
- NDSU provides all services to Research I and II buildings, under their lease terms.
- Park coordinates lawn care and snow removal for Candlewood Suites, Batcheller Technology Center (Appareo), former Alien building, Incubator; Deere Company handles own services.
- Communications:
 - Park does not have advertising / PR services on retainer
 - *The Edge* produced by the Forum newspaper with artwork supplied by NDSU Publication Services (at nominal cost), or occasional free-lance artist.
 - NDSU Publication Services produces materials for Innovation Week (at significant cost savings to RTP)
- Meeting rooms at Memorial Union are made available for *Innovation Week* or Park events at no cost.
- NDSU provides copier services, postage services to Incubator building and tenants (low charges)

As a general matter, through arrangements such as these, the RTP is able to continue to provide key services and support its operations in a cost-effective manner.

Capital Financing

Research I and Research II

The Park's initial buildings, Research I and Research II, were financed through bonds issued and guaranteed by the City of Fargo. The Park, in turn, holds long-term leases with NDSU, the buildings' occupant, which amount covers the debt repayment and servicing costs, plus an additional amount to help cover Park operating costs.

In the original plan, the primary source of funds for rent / debt repayment on the Research I and II buildings came from the earmark grants that supported the activities within the buildings. With these grants nearing their end (even with some time-extensions), the issue for NDSU therefore remains of providing for these payments.

Research I was expanded by approximately 35,000 SF during 2012 to 2014. Unlike the initial building, this expansion portion is owned by NDSU. This is as a result of it being financed through a combination of federal funding (\$5MM from the National Institute of Standards and Technology and \$4MM from an ND-COE Program grant, made to NDSU for this purpose).

Private Company Buildings / Research Park Ventures

Buildings constructed for Phoenix International, Alien Technologies, Appareo, and the Candlewood Suites Hotel were financed privately. To assist these and other economic development-related projects in the community, a separate financing subsidiary of NDSU Research and Technology Park, Inc. was created, named *Research Park Ventures, LLC*.

Park management has described the operation of this financing tool as follows:

Approximately 10 banks put between \$250,000 and \$1M each into this fund through no interest loans to the fund, which totals \$6.6MM. RPV entered into an agreement with the city of Fargo to participate in development in the Fargo Downtown Renaissance zone. Additionally, the state of North Dakota has a 45 percent state Tax credit that investors in the fund are eligible to receive.

This fund was required to invest half the money in projects in the Fargo downtown Renaissance zone and the remaining funds in projects in the Research Park. Zero interest loans were granted to various projects that are required to be paid back in 2018. At that time, the banks are returned their money interest free. More simply, the investors are granted an interest free loan to RPV in return for 45 percent tax credits. The fund invested in projects that are guaranteed by the company and/or personal guarantees. In 2018, the loans are paid back from each project and the fund pays back each bank investor.

Incubator Building Financing

Construction of the Park's flagship facility, which opened in 2007, was financed by \$6.9MM+ in state, private and federal funds. This includes a \$1.75MM US EDA grant; a \$1.25MM NDCOE program grant; and some \$3MM from local governments and businesses in the region. The project was notable for the strong public-private and federal-state-local partnerships that were leveraged to accomplish this goal. The RTP's 2013 Audited Financials cites the existence of a further legal entity, *ND Research, LLC* that was used for development of the incubator. This entity was reported to be dissolved as of June, 2013.

Overall, capital financing will continue to be a challenge, especially if / as mixed-use and multi-tenant facilities are programmatically desirable.

RTP as Community or *Place* in NDSU's Innovation Eco-System

Viewing the RTP as the *place-based element* of the University's *innovation eco-system*, and *judged solely on its physical lay-out*, the Park as it was physically developed leaves much to be desired—when its land design is compared with today's concepts and standards for *knowledge community place-making*.



Some observations about the Park as *physical place*—positive and less positive—follow:

- The incubator building itself is handsome, with innovative design features and it is located so as to present a strong identity to guests arriving from the airport.
- Research I and II present a clean, modern look that suggests technology and research.
- The facilities housing John Deere, Appareo Systems, and the building that formerly housed Alien Technologies are industrial and corporate in appearance.
- 18th Street, as a major arterial feeding the campus, divides the Park in such a way that—signage aside—it is difficult to perceive that the activities located east and west of the arterial have any relationships with each other.
- This is compounded by the fact that the Park's signature buildings—Research I, II and the Incubator—are located diagonally about as far apart from each other as they could be, completely failing to capture any sense of synergy and almost as if calculated to discourage collegial and informal networking.
- The hotel was a good idea. Some research parks include hotels—often serving as conference / meeting facilities. With food and overnight accommodations, they contribute people and activity—including after business hours. The Candlewood Suites is convenient to the FARGODOME; somehow, it does not appear that the hotel is part of the Park.

In short, while the individual buildings are architecturally appropriate, the buildings as an ensemble do not create a *sense of place*. They are spread wide apart—each a place unto itself, with that separation reinforced by the fact that (as JLG-Sasaki noted), they orient toward their respective parking lots—not toward each other or toward shared open spaces.



Plans and Studies: The Evolving Park

2008 Physical Master Plan—JLG / Sasaki

In 2008, the Park hired North Dakota-based JLG Architects, partnered with nationally-recognized planning consultant Sasaki Associates, to develop its first formal master plan to guide future development and provide an identity to the 55-acre site as a research park. (The Park's current management is not aware of any prior master plans, although individual site plans had been prepared for each of the previously developed buildings.) We may presume that the JLG-Sasaki Plan now serves as the roadmap for future development.

The JLG-Sasaki team evaluated the physical park as it appeared in 2008: the 55-acre site, bounded by NDSU's main campus to the south; 19th Avenue to the north (linking to the airport, the FARGODOME to the west and I-29 to the east); NDSU Department of Agriculture land to the west; and NDSU's Animal Nutrition Center and softball diamonds to the south.

The master planners captured this view of the Park, as it appeared through a professional land planner's lens:

The campus has a disorganized quality and poor image. There are no consistent setbacks, site orientations, or architectural styles common to these five buildings. Only one of the developed parcels has frontage on 18th Street and all of the building entrances are oriented towards parking. The developed sites consist mainly of a building and its parking lot, with minimal open space.

The 2008 Master Plan makes no dramatic proposals or cost-prohibitive recommendations. Rather, much can be achieved through consistent application of its basic land use concept, site planning tools, and signage and urban design guidelines. Its essential thrusts are to promote increased density; to reinforce the role of 18th Street through building orientation and public improvements; to establish a central node for the Park; and to build connectivity to NDSU main campus—all with an eye to having the physical design of the *place* help foster relationships between Park, NDSU, and the community. Among the JLG-Sasaki high-level recommendations are the following:

- To encourage increased development density with increased Floor-to-Area (FAR) ratios and reduced percentage of land devoted to parking
- To develop elements that promote a sense of place and identity
- To encourage a North Dakota design framework
- To promote features which contribute to a sustainable research community.

More specifically, they strongly encourage the Park to focus its future development North-South along 18th Street, to form a research spine *by orienting buildings to address the street and creating a central hub at the intersection of 18th Street and 17th Avenue.*

The Master Plan also makes a case for expansion of the Park by acquiring adjacent softball fields (on the southwest quadrant of the current Park), permitting not only the addition of 10 acres of surface but the ability to frame the Park's key *node* at 18th Street and 17th Avenue into a *100 percent corner*. Existing buildings could be expanded when demand justifies, with the intent to negotiate lower parking ratios with the City.

The net result is the ability for the Park to develop a build-out of up to 950,000 SF, while at the same time establishing the conditions needed to create a *sense of place*.

Other Strategic / Organizational Development Plans and Studies

Building on the directions set for the physical Park by the JLG-Sasaki plan, the RTP staff and Board undertook additional focused efforts to consider how the organization itself should evolve, in furthering its vision, as well as its mission of support to NDSU and in furtherance of community, regional and North Dakota priorities. Two of these deserve brief note:

Strategic Planning Process: *Connect. Build. Realize, 2011*

This internal document summarizes a facilitated Board retreat, September 22-23, 2011. The summary represents considerable work and some serious thought about the Park's future, providing a relatively recent and valuable piece of background for EKA's current Assessment. The document reaffirms the Park's formal Vision and Mission statements and includes a focused list of *Short-Term Objectives*, a list of urgent priorities. It also incorporates some Stakeholder Assessment; identifies the Park's potential in terms of strengths and opportunities; and proposes a refined future vision statement.

Most intriguing to EKA, the *Connect Build Realize* document describes three larger-scale, long term *Strategic Goals*:

- **Research Endowment.** A proposal to establish a \$100MM research endowment by 2016. The endowment would take the form of a public-private partnership that would build on the State of North Dakota's 2020 initiative, and would embrace both NDSU and University of North Dakota as part of its mission.
- **Intellectual Property Management Reform.** Reform of policies for Intellectual Property management, to make North Dakota and NDSU specifically into a destination for industry research partnerships, similar to a program cited in South Carolina.
- **Park Growth Targets.** Preparing to double the Park's real estate capacity by 2020, to achieve a goal of 700,000 SF developed and to establish 2,000 jobs in RTP by that date.

The *Strategic Plan* summary ends with proposed *Implementation Timelines* and steps, including for engagement of key regional and statewide stakeholders, and ties the Park strategy to a need for further strategic planning by NDSU related to its research agenda. It has been explained to EKA that

"...the Board did not complete the necessary work to turn these ideas into an actionable plan with...deliverables, metrics, etc. Therefore [it] was not ever formally adopted."

In September 2012, the RTP organization began a significant transition, with departure of its long-term Executive Director, Tony Grindberg. Mr. Grindberg left to assume a position with one of RTP's major tenant companies. The Park's other executive, Brenda Wyland, took over the Executive Director role in an interim status for 12 months and provided important continuity. In the situation that often results when an organization that has operated for a long period under continuous management then undergoes a transition, this transition period caused the RTP's Board to become more strongly engaged in considering the Park's future directions, including the subsequent appointment of Board member Chuck Hoge as Executive Director, and the Board's decision to engage EKA to undertake the current Assessment and integrated NDSU / NDSU RTP strategy development.

Despite the changing landscape at both the RTP and at NDSU (some NDSU participants in the foregoing strategic planning exercise also are no longer in their key positions), the issues and proposals contained in the 2011 retreat summary are substantive, point to

interesting potential directions, and should be revisited in *Strategy Directions* of this *Phase 1 Assessment*, and further considered in *Phase II Strategic Plan Development*. These are:

- The idea of a research endowment
- Intellectual property management reforms (along with other aspects of expanding the innovation and partnership capacities of the University)
- Specific targets for Park growth.

Feasibility Assessment for an Entrepreneurial Education Center in Downtown Fargo, ND, 2012

This study was prepared by Claggett Wolfe Associates in collaboration with the RTP and the City of Fargo, August 17, 2012.

The study addresses possible approaches to strengthening the entrepreneurial ecosystem of the Fargo region. As with the output from the 2011 RTP Board planning retreat, this study apparently did not lead to any formal action or implementation efforts by the RTP organization. However, EKA has discovered through interviews that “*there is a lot already going on in downtown Fargo with young start-up people,*” and there are initiatives being promoted by the Kilbourne Group and Arthur Ventures.

The focus for EKA’s engagement is a *Research and Innovation Strategy* for NDSU and its RTP. However, the University and the RTP also are major elements of the Fargo area and Red River Valley regional innovation eco-systems. Thus, consideration of how NDSU and the RTP engage in downtown Fargo and in the VPP strategy (described elsewhere) are certainly within the domain of a new *Research and Innovation Strategy*.

Consultants’ Observations

As stand-alone and related entities, the Park and Incubator form a large part of the *Research and Innovation* enterprise at NDSU. Following are summary observations:

- **Success.** By most typical success factors, NDSU RTP has enjoyed better than typical success for a university research park of its vintage—in development for about 13 years. The Incubator has deployed good programs and capabilities in its less than seven years of operation. There is a normal mix of young companies from the region and from the university. Overall, the Park and Incubator have significant company growth stories, a surprisingly large number of successful graduates, and some additional companies that represent current prospects for good growth.
- **Physical Character of the Place is Its Main Weakness.** The current physical design of the Park is an *existing condition* around which a more updated, community-supportive 21st century physical design can and should be developed. It is EKA’s view that the Park’s potential as a physical place—an important part of its identity and its marketability—has yet to fully be realized. Unlocking that potential should be accomplished in the next building projects, and there may be a need for site improvements, through which the JLG-Sasaki plan guidelines—or an update of them—should begin to shape the future park as a high-energy community.
- **Services and Benefits.** In addition to website information, and interviews, documentation furnished to EKA by the RTP staff show that the incubator services provided to tenants are extensive and largely substantive. For instance, assistance in applying for North Dakota Department of Commerce TBEG grants has been very helpful to some tenants. There is mixed review of services. Some tenants say their main reason for being in the Park is location / proximity to the students. No matter how good current services are, it should be a focus of Phase 2 work to improve them further. Also, there could be a discussion about service provision to virtual Park members.

- **Business Development Support.** Interviews revealed that the Coaching and Mentoring program is viewed with mixed results: it is not sufficiently intensive or in depth for the needs of some firms. Sessions are said to be spaced too far apart, with a changing mix of coaches at the meetings. Advisory Board members / Mentors do not always have specific industry experience keyed to the need focus of the tenant’s business sector; thus, their advice was seen as too general to help with very specific issues that start-ups face. In Phase 2, there should be more in-depth discussion of this aspect of services—and how best to deliver.
- **IT Capacity.** A possible concern is that the facility’s information technology capabilities reportedly are not sufficiently robust to accommodate the needs of companies, particularly those in the software areas. (We did not investigate this, but it could be a discussion in Phase 2.)
- **Wet Lab Space—Small Quantity.** While the RTP has been able to retrofit an existing suite to accommodate a life science tenant (e.g. fume hoods, sinks, etc.), the facility is not truly suited to companies with significant research needs in biology or chemistry. Creating a small amount of true wet lab space should be a consideration in programming the Park’s next multi-tenant building.
- **Marketing and Communications Updates.** In the past (and when a different mix of staff support made this possible), marketing and public relations efforts to promote RTP and the Incubator were extensive and well-executed. Indeed, we would rate the RTP’s communications materials and activities competitively against those at most US research parks. For pragmatic reasons, marketing has taken a back seat in the last few years. Going forward, the Park and NDSU will need to again devote more attention to these functions. It is likely that a new set of messages and brand will emerge from this planning—with the RTP positioned much more closely as a part of NDSU than it was in the past—a major element of the *NDSU Research and Innovation System*.

10—ASSESSMENT: SUMMARY OF INTERVIEW FINDINGS

Although a few interview comments can be found interspersed in the text in other sections of this report, the consultants decided that it might be easier for readers to gain an understanding of the collective impact of interview findings, if comment examples were grouped together. Hence, Section 10 contains interview comments, organized under:

- State of North Dakota
- North Dakota State University—General Comments
(academic and institutional contexts for *Research and Innovation Strategy*)
- NDSU *Research and Innovation*
- NDSU Research / Technology Park and Incubator.

State of North Dakota

- The culture of both the State (and the University) is very conservative and risk-averse. For example, one interviewee commented: *In 2007, when the oil boom started, people immediately said: 'This cannot last, so we can't invest in infrastructure.' If you scratch anyone lightly, you will find skepticism about change and risk.*
- The State and its businesses traditionally have been oriented to agriculture, but now North Dakotans need to embrace STEM more broadly in the economy.
- *North Dakota needs to evolve into a culture that tolerates risk, even to the point of accepting failure*
- Some interviewees comment that the State's small size can be a 'plus' factor, in that it encourages partnerships
- Some interviewees indicate that the universities receive a mixed message from the State: *We want you (institutions) to start businesses, but we don't want you to compete with businesses.*
- There is a sense that the State (maybe referring to voters?) more clearly understands the value of investments in workforce, including education / training of high-level people to fill jobs and start businesses, than it understands the value of knowledge creation/research. The State is *OK* on investing in research and has done some significant investments—most recently *Research North Dakota*. But, nonetheless, it still seems harder to sell the idea of research investments than it is to sell the idea of workforce investments. Put another way, aside from Agriculture (which is well-understood), the higher education system has not yet been fully successful at selling the value proposition of research investments to the public. Some say: *This "needs work."*

North Dakota State University—General Comments

Interdisciplinary Programs—Graduate Education and Research

Given the importance of multidisciplinary research and graduate programs to 21st century *Research and Innovation*, there this subject was discussed in academic interviews.

- According to interviewees, NDSU has only eight interdisciplinary graduate programs:
 - Cellular and Molecular Biology
 - Environmental and Conservation Sciences
 - Food Safety
 - Genomics and Bioinformatics
 - Materials and Nanotechnology
 - Natural Resource Management
 - STEM Education (the teaching of science)
 - Transportation and Logistics.

- STEM Education is a dual track, Doctorate in Physics and Education (teaching of science). Appointments are 80 percent in science and 20 percent in Education.
- *All except STEM Education apparently were proposed by faculty. STEM Education was proposed by the previous NDSU president (a top down idea).*
- Faculty members are not appointed to these interdisciplinary programs; the program directors are full-time faculty in their respective departments.
- *Some of these programs came from grant proposals, like the NSF IGERT program, but none ever got grant funding. There always were some core faculty in these areas.*
- Student enrollment in these programs is minimal. The programs vary in student numbers from about three (3) in STEM Education, to seven (7) in Genomics, to about sixty (60) students in Natural Resources Management.
- *Few of these programs have industry partnerships or offer internships / apprenticeships.*
- *The interdisciplinary programs are seen as competing with departmental / discipline-centric programs.*
- *Currently, there is no incentive for faculty to collaborate across disciplines.*
- Possible solutions to these challenges that various interviewees mentioned included:
 - Hire faculty that span departments (or colleges)
 - Incentivize deans and departmental chairs to create curriculum so faculty can teach a course that spans department
 - Find ways to remove physical barriers to collaboration
 - Empower deans somehow to develop interdisciplinary priorities.

NDSU's Physical, Administrative, Policy, Funding and IT Infrastructure

Following is a sample of interviewee comments about aspects of NDSU's internal infrastructure—administrative, physical, and IT—often described by interviewees as barriers to expansion of *Research and Innovation*. Direct quotes are shown in *blue*.

- NDSU's most important IT / operations need is a paperless document imaging and routing system.
- Physical infrastructure needs—there are both general and specific facility needs.
- *The buildings are terrible—102 years old.*
- *We do not have sustainable funding models for new initiatives.* Faculty complained that, in the past, the University received short-term earmarks to create new centers; when the funding disappeared, so did the initiative.
- The administrative structure is thin. Very few colleges have had associate deans. For example, the College of Science and Mathematics, with 1,800+ students, just hired its first Associate Dean.
- There is insufficient travel money to attend professional conferences and to visit federal grant-making agencies (e.g., *The Director of the Center for Surface Protection got all three contracts by going to Washington, DC*)
- Possible solutions to these challenges that were mentioned included these:
 - Some deans say that central administration needs to set priorities and then incentivize work in those priorities with money, policy initiatives, and space allocations.
 - An approach is to create central grant opportunities for things that are established as priorities, through the Provost's office.
 - NDSU would benefit from consolidation of core labs, state-of-the-art instrumentation, a centralized animal facility, and an Agriculture genotyping facility.
 - *NDSU needs to invest more money in research and teaching assistants, to support research.*

Faculty Culture and Rank / Tenure Issues

Distinguished faculty, NSF awardees, and deans, among others, offered comments such as these about the faculty culture, rank and tenure policies / process, and related factors that are considered challenges to progress in *Research and Innovation* growth:

- Some faculty say that *there is often little appreciation for basic research* (arguing that the emphasis presumably is on applied research)—*WE NEED BOTH*. (EKA Note: This likely is a two-way concern, with some faculty perceiving that there is little appreciation for basic research while others claim little appreciation for applied research.)
- *There is a toxic split between teaching faculty and research faculty.*
- *It is a mistake to allow committee work to substitute for research.*
- *Professor of Practice Program needs to be scrapped / reworked—instructors are treated as tenure-track; the university does not benefit from ‘real world’ connections* (EKA Note: Some, but not all, deans agreed with this characterization).
- *We need to reward service to the community (engaged scholarship).*
- *The current tenure process is not really in hands of the departments; promotions and tenure must be approved by the upper administration.* (EKA Note: We found this remark odd.)
- *We are going soft on tenure.*
- *Non-research faculty members dominate committees and impede research faculty.*
- *We need the administration to develop a shared vision with/for faculty.*
- *Deans play a key role in establishing norms, culture, and policy* (faculty comment).
- *Getting a patent has as much weight as a journal article.*
- *Workload assignments are made without reference to how much research the faculty member is doing.*
- *Departments do not think about how an individual fits into a team.*
- *Committee work is allowed to count in lieu of papers, patents, conference presentations, etc.*
- *There is too much driftwood—consequently, there is no incentive to work hard, do research—except for self-motivation.*
- *We need to value innovation, teamwork, interdisciplinary collaborations in making tenure decisions. Also, we need to realize interdisciplinary collaborations are very time-consuming—the time needs to come from somewhere.*
- One dean suggests offering faculty entrepreneurial leave—and that dean has a draft of such a policy, which has not been approved.
- Distinguished faculty group: *We need model for faculty to move in and out of research and back to teaching without damaging their careers / getting off the tenure track.*
- *We need space for interaction with the community.*
- *You cannot dictate to faculty what to research, but you definitely can incentivize—many faculty would welcome the opportunity to work on applied research.*
- A challenge in the public health school—*There is little cross-fertilization between full-time faculty and practicing clinicians that come in 1-2 days / week to teach.*

NDSU Relationships with the Business Community—NDSU Views

This topic is included as a general NDSU topic, rather than *Research and Innovation* only topic, because there are comments pertaining to academic programs and student preparation included, along with comments about *Research and Innovation* partnerships.

Following are comments from NDSU interviewees, to describe what they believe about the business community's needs and interests. As before, quotes are shown in *blue*.

- *We hear [the business community] say: We can train them. Send us people who know how to learn, be adaptive, be team players, etc. (EKA Note: This seems inconsistent with some views expressed by business leaders in this study, but it is consistent with business views we have heard expressed for 30+ years.)*
- *So, we need to say, regarding this study you are doing: We will make an investment in workforce training in fields X, Y, and Z. And, we will invest in knowledge creation through our research institutions. What the **State and its businesses** have been good about is recognizing the first one—workforce. We say we need money for a medical school, nursing, STEM, and they all understand.*
- *CNSE and CCAST are children of what industry wants. We always must remember that companies are very good at evaluating faculty, facilities, publications, research at universities (not only local) and they are very good at deciding what is good and what is not good. But, they do not want to deal with the faculty framework and the faculty way of doing things. They want to deal with separate entities that can more closely match their business style of doing things.*
- *We have the mind-set that you only get to work with the university on our terms and our turf. I hear more from businesses about meeting them on their turf. I see no reason why we cannot develop models for that. We have co-funded faculty positions. People are going out into the field. That's what the business community wants.*
- *Sanford Hospital has put significant money on the table for better health care through personalized medicine. But, we do not have a (campus-wide) planning process to help Sanford figure out how to spend those funds. Sanford also earlier offered to partner to create Sanford-Fargo Research Institute, but the company has not put a research division here yet, because we couldn't get our act together.*
- *Faculty intransigence makes it hard to quickly negotiate partnerships with private companies. It took us three years to negotiate an agreement with Monsanto. Kansas State did it in three months. Another company walked away when negotiations with us stalled.*
- *Businesses are increasingly looking for students with experience abroad (key countries: Brazil, India, China, Canada).*

NDSU Relationships with the Business Community—External Views

Following are comments from external (non-NDSU) interviewees, to describe what they believe about the business community's needs and interests—what they want from NDSU.

General Observations about NDSU

- NDSU in general is seen positively with respect to its workforce development contributions, along with being a community image asset:
 - *NDSU is such a good institution, period. With its strengths in Engineering and Agriculture, the quality of its graduates...there are so many plusses going for them*
 - *NDSU's role in [meeting our workforce needs] is huge. In addition to their educational programs and high ranking, their athletic programs are very important [as part of the community quality of life].*

- *There is outstanding collaboration between the business community and the University...to ensure that graduates have the right skill sets.*
- NDSU also is seen as a positive with respect to entrepreneurship, generally:
 - *Entrepreneurship needs to be a big part of your strategy; incubator graduates like Myriad Devices and Pedigree Technologies are our Poster Children for success [along with others like Great Plains Software and Scheels Sporting Goods]*
- But at the same time, there is a sense of NDSU, in general, not having sufficient focus:
 - *We need the university to have a strategy. Some departments have done that but as a whole we're not there yet.*
 - *With respect to the NDSU research and innovation enterprise, it is not a matter of WHAT to focus on as much as HOW to be focused. And, it has to start at the top.*

Business is Focused on Workforce Issues

Workforce is an overriding concern of business and economic development leaders, with implications for *partnership development*—both positive and negative.

- *In 2013, our company hired a person to focus just on connecting with the university: interns and a work-study program that allows students to work 15-20 hours / week. In 2014, [we] will be expanding at the Park and increasing our Visiting Senior Designer Program, with guest speakers. Also, we have a program for former NDSU interns—so the best of them stay connected to the company and stay here.*
- *We just sit on their land—that's it. We don't extract value from the Park in terms of services and support. The value for us is not in research or coaching; it is in proximity to the NDSU Campus, period. Location, location, location. In order to recruit talent from the NDSU Engineering School. Plus, our name, our brand, is in front of the students.*
- *Going forward, the focus on workforce will be critical. There are reportedly 5,500 to 6,000 vacant positions, a 2.7% unemployment rate. There are war stories of companies needing to hire 50 or more new employees ASAP. Some are opening satellite offices in cities such as Phoenix, Denver and Minneapolis in order to get the employees they need to cover certain functions, especially IT. Manufacturers are also doing it; there is danger of not getting them back.*
- *We want talent, talent, talent. [Our company] is focused on [products] that involve complex manufacturing processes. We would like to avoid having to invest so much in training people.*
- *The State's challenges: Workforce. Kids who are coming from Minnesota to study now may stay because of the opportunities.*
- *The reason for our company being at NDSU and the Park is that it's the strongest pipeline for talent. The engineers are here; 65% of our engineering staff comes from here.*
- Workforce = the Chamber's #2 priority (after flood protection). Quality of life issues and Fargo's reputation make recruiting from other areas of the country / world difficult:
 - *We need the right people to fill vacancies so businesses can expand.*
 - *We need to retain promising students here and attract workforce from elsewhere.*
 - *Students need teamwork and communication skills.*
 - *A company CEO: The biggest problem in Fargo is the talent pool; we often have to train graduates more in biotechnology manufacturing processes.*
 - *We need students who can hit the ground running. It can take one year to get an engineering grad up to speed.*
- *We need one-stop shop for businesses wanting to access NDSU resources.*

Difficulties in Interpreting What Business Wants

It has long been our impression that just *asking companies what they want in general*, can lead to confusion. Sometimes, they express a desire for basic intellectual skills; other times, they say they need quite specific occupational skills. Sometimes, the answer one gets depends on the level in the business organization of the person to whom the query is addressed.

This is much easier to get straight if one avoids generalities, that is, when the dialogue is about the content for a *specific partnership agreement between the university and a specific company or industry group*.

- *We need business advisory groups for specific industry sectors—we / they must be truly collaborative and focus on curriculum design, internships, etc.*
- Problems were noted with computer science:
 - An audience member at the Symposium noted a talent problem with software engineers.
 - *The lack of a comprehensive computer science department at NDSU is a regional deficiency. The training of engineering graduates is not up to snuff. There are reports that Microsoft gets applications from recent graduates with degrees in entrepreneurship or business but then has to ask them, ‘Can you write code?’. There is a need to teach young people to communicate better, work in teams, etc.*
 - *We lack a “comprehensive computer science department” at NDSU; this is a regional deficiency—students lack coding skills.*
 - *We need more experiential learning experiences / internships for students.*

Opportunities and Environment for Innovation Partnering

These comments reflect paradoxes and contradictory statements from different parties—some very positive, some negative; individual perspectives and experiences must be considered. These statements also reflect differing relationships between the institutions in the Red River Valley region.

- Some business perceptions reflect the fact that no effort has been made to foster partnerships for solving basic problems that do not rise to the level of “fancy” research:
 - *A military focus has driven R & D at NDSU. By comparison, our challenges are very basic. There are many needs [we] could get help with. For example, we paint our own equipment. There are unique problems with paint and adhesives; things related to welding and fabrication processes; cutting metal; etc. We would welcome more research related to anything having to do with metal, metallurgy.*
- *You should try to meet Gary Smith, NDSU Dean of Engineering. He has the desire to work with businesses, sees things from a business perspective. He does not always get heard. It (Engineering) is a flagship at NDSU but hasn’t been invested in.*
- *I am very skeptical about NDSU and its commitment to commercialization. Show me what they have done, in commercialization, in attraction of industry partnerships. The Navy story [about coatings they have licensed] is 10 years old.*
- *From an ‘Innovation’ standpoint, there’s an opportunity for the two universities to work together more closely.*
- The College of Agriculture has a tradition of partnering since the beginning, and these capabilities could evolve further:
 - *Our board loves funding these projects at NDSU, but we want to be more involved in helping set the priorities, to ensure long-term benefits for our growers. For example, dealing with water problems. We are collaborating with NDSU Ag Extension on soil health research at The Share Farm; helping fund proposals.*
 - *I will go to bat for Dr. Carena any day of the week because he will eventually develop something that will help our farmers. [And] we are working with Dr. Chad Ulven [College of Engineering] on creating polymer-based products out of distillers grain by-products (from Ethanol). We are helping his company [in the incubator] solve the supply chain issues, aggregating the inputs.*

Specific Opportunities and Needs in / for the Bakken Region

These comments were of particular interest to EKA, as they reinforce what we have concluded should be a major priority focus for NDSU.

- Opportunities for partnerships also could be developed specific to the Bakken oilfields and the needs of western North Dakota. There is interest in developing a list of needs of the oil industry and that region:
 - *The list changes. For every challenge there may be five solutions. From an entrepreneurial side, you have to be very nimble. The problem is that you're trying to chase the tail.*
 - *Every single aspect of this has challenges and opportunities, e.g. how to re-use water, non-potable water, for fracking. We need NDSU to create a brain trust to be part of this.*
 - *We brought top business leaders out here to see this, all the smart guys. They get it. But we need more people engaged. It's about creating a North Dakota solution, e.g. what percent of this business can be Caterpillars? Bobcat's? etc. Let's figure this out.*
 - *Ag Extension has been non-responsive to the oil industry needs. We need help with waste management research. However . . . NDSU Ag Economics Research has been a bright spot.*
 - *We are partnering with the Lignite Council to bring a group of NDSU professors out for a tour, to see first-hand what is going on and the needs.*
- Some NDSU College of Agriculture researchers have been actively working on issues in the Bakken Oil Fields; however, UND appears much more actively engaged, including through its Center for Innovation. While UND has historically been the dominant player in energy research through its Energy and Environmental Research Center, the view of oil industry representatives is that there exist many more opportunities for NDSU to play an active role in addressing solutions to a wide range of Bakken issues, ranging from scientific and technical to matters of urban development and delivery of services to the region's growing population.
 - *NDSU is not nearly as connected to the community as is UND, on either side of the state. I never knew this before [the Valley Prosperity Partnership study]. I had not appreciated this difference. NDSU is not at all connected.*
 - *The climate is positive. The two presidents get along. There would be incentives for both, in terms of getting things from the Legislature. There is separate funding for the two Research Universities from the other state institutions; they are in a different class. But this [sense of cooperation] has to make it down to the level of Provosts and Deans.*

Business' Experience with Other Universities

Some businesses indicated they have had more success, or more history in partnering with other academic institutions—regionally or nationally. These were not direct criticisms of NDSU, but these comments point to opportunities that could be further developed.

- *We are working with Concordia on health care informatics, technology, computer science, curriculum to help students understand data, and what the opportunities in that field can be. How to USE Big Data. Creating a Big Data core. This is about 'analytics,' not 'programming.'*
- *In Europe, there are a lot of university-industry consortia. Other than direct help from NDSU, we get most of our academic research support from a 7-institution consortium that was established in 2005 with an NSF grant and includes Purdue, Vanderbilt, University of Illinois, and others. It pulled in "all the players" in the industry. We consult a lot with a Russian professor at Purdue, a \$50,000 project.*

- *We have instituted a new program with Minnesota State University Morehead (MSUM), a ‘Sector Breakfast.’ The President, Deans, et al. meet with companies and the President asks: ‘What do you need?’ Second and then third-round sessions to get feedback from companies have led to starting a Master’s Degree in Health Care; changes in curriculum; combining of departments. MSUM is doing some things incredibly right.*
- *In the real world of companies, it’s ‘tell me what questions you want answered?’ And, they want to know where they can get the best answer. If they can get that at MIT, Cal Tech, Carnegie-Mellon, they will. ALL top research institutions are scratching to get industry contracts. The question is: ‘Are you the best? What are the terms and conditions for getting the information?’ [e.g., ownership of IP].*
- *[We have] similar relationships at University of Minnesota, U. Wisconsin, Iowa State. We want to do projects with NDSU’s students also. It helps them develop and we build relationships from a recruiting standpoint. We fund a \$10,000 scholarship each year at UND and at NDSU. But the number of students graduating is not sufficient to meet our needs.*

College of Business

NDSU’s College of Business was the target of a surprisingly large number of comments. EKA discussed this matter in-depth with Dean Johnson, and we understand the contexts. It is important to say that we have seen this similar situation *at several other universities*. Nonetheless, because comments about Business were so ubiquitous, several examples of the comments are reported here. As elsewhere, direct quotes are in *blue*.

- *The Business School has been largely disengaged; businesses are asking for entrepreneur education outreach courses, but the B-school is just focused on FT students; UND offers highly sought-after entrepreneurship certification*
- *The Engineering school is good at working with the Business school, but other schools have had less success*
- *How can you connect the business school accreditation process with requirement to offer minor in entrepreneurship?*
- *According to a knowledgeable interviewee, tenured, senior Business faculty are committed to their model; younger, non-tenured faculty do not want to ‘rock the boat’ and risk not getting tenure*
- *There is ongoing resistance to new initiatives: For example, faculty curriculum committees would not approve new classes in leadership, so now this is offered as independent study with an experiential learning component. (According to the Dean, the business community likes this program.)*
- *Accounting/Finance/Info Systems will not count study abroad towards degree requirements*
- *It is so collegial that ‘collegial’ is actually a detriment.*
- *It was discovered just prior to the re-accreditation process that faculty did not hit the mark on publications and other demonstrations of staying current; this led to continuing “six-year review”*
- *There is no interest and no funding for NDSU’s own Entrepreneurship Certificate; students have to get this as continuing education credit from UND—and they must pay extra!!—NDSU recently got a grant from the Larson Foundation for scholarships for a few students.*
- *Only Accounting and Finance departments require internships as a graduation requirement.*

NDSU Research and Innovation

Current Areas of Research Strengths

Interviewees variously mentioned, and there was some degree of agreement that the following areas of expertise are NDSU research (and program) strengths. EKA urges that this list be treated as the first cut at a list of candidates from which a few priority niches for special investment would be developed, in Phase II planning and decisions.

- **Agriculture / Plant Science, including Precision Agriculture.** This is undisputed as the single greatest area of strength, prominence, and competitiveness. Comments included:
 - The NDSU greenhouse is the \$10MM anchor for Phase I of a \$30MM initiative to make North Dakota #1 on “Northern Grown Crops.”
 - *In the realm of Agricultural Risk Analysis, Bill Wilson is world-renowned.*
- **Coatings/Polymers.** *This is the world’s largest lab in robotics related to coatings.*
- **Chemistry.** *This department is really trying to focus more on applications of its research.*
- **Health Sciences and Public Health.** (Although there is no Medical School, NDSU is strong in pharmacy and nursing, e.g., telemedicine (the largest tele-pharmacy network in the world, with funding from DHHS Office of Advancement and Tele-health). Thrifty White Pharmacy in MN wants a partnership. There are evidence-based delivery models. Plus, there is a Master’s in Public Health with a completely unique track in Native American health.
- **Electronics/Sensors.**
- **Civil/Electrical/Chemical Engineering.**
- **Big Data Analytics / Supercomputing.** Some comments/questions included:
 - *Do we really have a competitive strength in Big Data compared to other universities?* (EKA Note: This is not the most important question. There clearly are universities with much greater Big Data capabilities. Ohio State just announced it will add 50-60 faculty in Big Data to its existing group. But, it doesn’t matter. It is completely necessary for all research universities to have Big Data/Analytics capabilities, as this is now a ubiquitous skill and tool set for research across many / most fields. So, NDSU’s CCAST is a critical resource and the better question is: *What is its correct scale and how can it be preserved and grown, so that it serves overall research growth—with both faculty and industry partner users?*
 - *How can we build on CCAST?*
 - *How can we improve Data Visualization capabilities and integrate into other fields (biometrics, data mining, analytics, oil / gas industry)?*
- **UAVs.**
- **Biotech/Bioengineering.** Some faculty and staff are bullish on prospects for bioengineering, e.g., *Biomechanical engineering and NIH grants are NDSU’s sweet spot*

Others were not at all of this opinion, and indeed urged caution to not select this area. Some comments included:

- Venture capitalists have come to look at NDSU biotech and the results were not encouraging
- The Center for Biomedical Research was a train wreck. We do not have the tools to succeed in this area. NDSU researchers don’t seem to understand marketplace needs.

National Information Solutions Cooperative (NISC)

NISC is an information technology company that develops and supports software and hardware solutions for our Member-Owners who are primarily utility cooperatives and telecommunications companies across the nation. NISC is an industry leader providing advanced, integrated IT solutions for consumer and subscriber billing, accounting, engineering and operations, as well as many other leading-edge IT solutions.
www.nisc.coop

- **Software Development.** *We have the second largest Microsoft Campus in North America here. There are tremendous needs for software developers across the State. One of the four locations of the National Information Solutions Cooperative (NISC) is in Mandan, ND.*

Research Funding and Infrastructure/Support Issues

- *The State's new funding formula is based on credit hours, not research. (EKA Note: This is not at all unusual; in fact, it is typical in other states.)*
- *The State was and is OK on the research investments. It was the Centers of Excellence; now it's Research ND (\$29MM challenge grant.) And, the State supports ND EPSCoR. But, here is where the big difference is: North Dakotans understand workforce education and training. An employer in the Bakken area says: I need welders, or nurses, or police officers. But they don't understand research. So, we have not done a really good job of explaining what the universities do and why it matters to businesses. We have not made that argument well enough.*
- *We need to articulate our priorities and then ask the State for money. We must be more strategic about how we spend the money: For example, we got \$6.4 MM in incremental new money for the biennium. The decision-makers just spread it out to all the units.*
- *The Dean of Agriculture has suggested that he would be willing to explore a different funding model for the College of Agriculture (modeled on Michigan State). At Michigan State, they take Experiment Station money and buy time from faculty in Engineering, Human Development, Sociology, Science/Math, etc.—as long as those individuals are working with issues relevant to the Ag Experiment Station. An adaptation of the Michigan State approach would raise some funding model issues that would need to be resolved.*
- *NDSU needs \$200MM capital campaign to support research*
- *NDSU needs to attract a few 'star' endowed faculty (for example, 3 at \$33MM) with their staff, especially in priority multidisciplinary fields*
- *Support for grant preparation is grossly inadequate—We need professional grant writers with knowledge of agency programs.*
 - *At other universities, some staff have expertise in particular types of grants (e.g. NIH grants)*
 - *At other universities, deans have had weekly meetings with VP for Research*
- *Deans claim they have been out of the loop on contracting relationships—that they are not consulted ahead of time.*
- *North Dakota's public and legislature do not understand the value of liberal arts, leading to creeping vocationalism, including in respect to what can get funded. (Now in ND, those with 2-year degrees often earn more than those with 4-year degrees...so the 'vocationalists' may have something of a point.)*
- *We need better relationships overall with state agencies, the State Board of Higher Education, and the Legislature.*

Impediments to Industry Partnerships and Commercializing Research

- The Open Records policy is a problem. *We can sign confidentiality agreements with business clients, but we cannot enforce them.*
- The idea of a Translational Research Foundation was explained. It was an idea to create a 501(c)(3) type 3 entity and thus be able to enter into joint ventures with private companies, who would serve on the entity's Executive Committee. In effect, it would be a pooled sponsored research organization, modeled on University of Georgia Research Foundation. Others claimed that this new entity was not necessary, that the functions of joint ventures with companies could be accomplished via existing entities—the Research Foundation or the RTP corporation.
- *We need reciprocal relationships with businesses to foster an innovation ecosystem.*
- *Some (people) are overly focused on start-ups, despite the fact that scientists do not make good entrepreneurs.*
- *We (NDSU or ND) do not understand the role of licensing well enough, and we even need to go out of State to get expertise.*
- ND statute: All university intellectual property is state property. This has caused some confusion even in the hiring of students by companies. There are efforts to clarify this.
- *The Research Foundation (RF) exists because the Century Code says that the President can assign IP to certain types of organizations. RF's role is to take assignment of anything that might have commercial potential. The President has authority to assign IP to other not for profits, but default always has been to the RF. The RF serves all the traditional tech transfer roles: term sheets, negotiating deals, setting royalties. The RF has high expertise in doing this in Agriculture. About 85 percent of the revenue stream is Agriculture. And that also has become a topic of attention: In RF, 85 percent of the work is unrelated to Agriculture and 85 percent of the revenues are from Agriculture.*
- *IRS regulations on tax-exempt bonded facilities complicate matters—if bonds are tax exempt, less than 5 percent of the facility can generate revenue, so if NDSU gives away IP to private companies, we may run afoul of bond restrictions. (Note: EKA found this comment confusing. It seems to mix the 5 percent “private use” restriction which does apply to occupancy in tax-exempt funded facilities with the generation of revenues from intellectual property, which should be a different matter. We may need to inquire further for clarification.)*
- *We are seriously understaffed. We just tried to recruit a licensing associate, but both candidates turned us down (The process took too long?)*
- *Most of our license revenue is from licensing Agriculture IP. Coatings/polymers have strong IP, but their work often needs additional R&D after licensing before getting a product to market.*
- *There is a ‘tug of war’ between Sponsored Programs and the Research Foundation.*
- *The RF Executive Director reported to the VPR initially. There is a convoluted structure that needs to be analyzed and perhaps updated. (EKA Note: The Director of Tech Transfer who also is the Research Foundation Executive Director, still reports to the VPR, but also to the RF Board of Directors. In EKA's experience, while slightly complicated, this is a completely typical dual reporting relationship for positions like this. Any complexities need to be “managed,” but the reasons for the dual reporting are logical.)*
- *Faculty Comment: NDSU's knowledge base in tech transfer is limited; we need staff with scientific subject matter expertise. The staff is too small, conservative, and slow.*
- *RF Perspective: Agriculture IP is a complicated portfolio—NDSU is losing market share for commercialize-able varieties. The private sector is increasingly developing varieties. We have a concern about royalties from our varieties not being plowed back into Agriculture, but instead going to other uses—there is room to increase royalties if the funds ‘flow to the right places.’*

- VPR Office Staff Perspective (including the commercialization team): Some comments:
 - *Licensing is ‘on the back burner;’ the number of disclosures has dropped off since the licensing associates left.*
 - *We need a dedicated marketing person.*
 - *We need staff with contacts at the type of companies that would want to license the IP (e.g., paint and coating companies).*
 - *We need to educate faculty about what sorts of things can be protected.*
 - *We need more travel money to send staff to professional development courses.*
 - *Companies want technology ‘a little more developed’ before they are interested in licensing. EPSCoR has had some success with this.*
 - *We need more funding for prototyping. This is especially an issue for plant sciences; NDSU researchers ‘don’t have the product’ to provide for testing.*
 - *VPR’s location on edge of campus is a challenge. Faculty perceive the Research Park as too far from campus. When the VPR Office was located in Old Main, they were constantly bumping into students and faculty. (EKA Comment: The solution may be: Instead of moving VPR to campus, **make the Park part of the campus.**)*
- Perspective of NDSU Incubator tenants included the following comments:
 - *In the transition of launching a new business and seeking to migrate to the Incubator, the role of NDSU Tech Transfer plays a critical “portal” role:*
 - *When I negotiated with NDSU to use my technology, there was pressure for me to leave my faculty role. I was pro-active in suggesting a different approach for licensing to the Tech Transfer Office. I proposed an equity stake in lieu of legal fees, plus a small royalty. I brought a boilerplate agreement to them to consider.*
 - *The TT office is short-staffed and lacks a range of staff to vet all the technologies. This was the first time they had done a transaction like this. I had the advantage of a business partner who was sophisticated. We got ideas by looking at the UNL and Utah tech transfer offices. We studied to find models that worked and we took them to NDSU Tech Transfer. Our business would not have been able to do this without having a business-type person already on board.*
 - *My big complaint is that TT Office is short-staffed. But [they are] very open and flexible, considering that they have never done some of these kinds of transactions.*
- Observations on IP Issues and Tech Transfer from Regional Businesses, Park Tenants
 - *There are two kinds of Tech Transfer offices—those that understand and help build businesses, and those that are there to protect the university.*
 - *Every major in the university has a Capstone project requirement. We know about the student IP debate / controversy. University Red Tape is too complex.*
 - *IP protection is to protect vested interests, to protect from lawsuits. But it is squeezing innovation out to other places.*
 - *In the software area, there is a lot of talk about IP. This has to be addressed. In order to get companies interested in working with us, there needs to be a framework in place that would not create IP deliverables.*
 - *Because our software was developed with federal research funds, NDSU owns all of it [the IP]. The negotiation of a license with the University took years. They tortured us. We hired our own lawyer last Spring. After [certain personnel changes], the University ‘gave up’. They now are releasing 100% of the rights, with no equity and no license fee.*
 - *There is a sense of inertia at the University. We hear that the process of IP is a mess. While we understand some people clearly are pushing this issue, it takes the luster off of what we’re doing.*

NDSU Research and Technology Park and Incubator

Some within the business community would like to see NDSU and the Park more strongly communicate an integrated vision and strategy for *Research and Innovation*, and to see all these elements more clearly integrated in a holistic strategy. (EKA Note: NDSU and RTP leadership know this. This is why NDSU and NDSU RTP undertook this study.)

- *For the general public, people don't understand what the Research and Tech Park does. People don't know what an incubator does. There is a need for more public information and outreach.*
- *I was taken aback by the Great Wall of China between the Park and the campus. It's staggering. Until the structure is resolved, nothing will happen, it will be irrelevant.*

Incubator tenants shared the perspective of larger established companies on the value of access to the talent pipeline, as a primary reason for locating there:

- *The main advantage for me to be located at the Incubator was to be close to students.*
- *This facility is fantastic for access to students—so close. And it is easy to get access to other companies in the park like Bobcat and Deere.*

Some with longer histories sense that the Park and Incubator remain works-in-progress that constantly are improving:

- *I came to the Park in 2004, when the Park and Incubator were just getting off the ground. I understood they were new and they were learning too. I understood when I started there was no infrastructure yet, and hoped it would develop, and it has.*
- *The rent was high and they didn't know what to do to secure their start-ups.*

Comments from NDSU tenants in the Park bear on the question of how partnering between NDSU and the Park can be improved:

- *What could the Research Park do for us, so we can do something to help the Park? It would be to help us meet potential partners. We have to ask the private sector what they want, and, can the university provide it?*
- *We have been in the Park, doing our own thing, but never have worked with the companies in the Park. John Deere is working on Precision Ag but has never come to ask us for anything. I've never been to Appareo.*

Facilities

- *Front desk; copier, and free coffee!*
- *Perhaps the Park/Incubator could facilitate getting easier access to University equipment for its tenants.*
- *We assumed the building's internet service was on the university pipe system, but it is not. It has 'hair pin routing' as a security feature, through an independent provider. It is very slow. It does not work as a tool for a software company.*

Staff / Support for Business Development

Comments about Incubator programs / services—positive and less positive—included:

- *Good and pro-active staff support in the past has been appreciated*
- *(The Incubator Director) had contact with ND Department of Commerce, helped us get to grants to pay for marketing, a market study; also grants for interns (STAR).*
- *As an incubator tenant, I had frustrations. I was told to go talk to the NDSU Career Placement Department. When I got there, I was going through the front door, finding myself competing with IBM.*
- *Business mentors, quarterly meetings. I was bombarded with questions, but they are a source of ideas.*

- *Since we've been in the building, we participated in the Coaching / Mentoring sessions, which are held quarterly. These are volunteers, and they are sincere about wanting to help. But, at the first meeting, some could not make it. At the next meeting, we had to spend time re-explaining things, and the newcomers had (the same) questions. Then our time would be up.*
- Some tenant companies are finding their own solutions to getting needed expertise to build their businesses, as a kind of 'work around' for perceived or real limitations of the Incubator's program support:
 - *We now have a small board of directors. We gave them equity. One is a former 3M executive. We did not get the type of help we needed from Coaching & Mentoring, so we bowed out of the sessions. We have formed a faculty working group to provide technical support (via Dr. David Wells, Industrial Engineering).*
 - *My first session with the Coaching & Mentoring did not go well because I did not have a PowerPoint. I don't have a board of directors, but I have found 'go-to-people' at (name of a company in the region). However, I have had good one-on-one side discussions with some of the mentors.*
- Some current and former tenants pointed out the need and opportunity for additional, strengthened services to help start and build businesses, especially for faculty:
 - *NDSU has lots of professors who know nothing about business. There is need for more of a 'translation service' between the academic and business world. Faculty need someone to explain things to them, with authority.*
 - *There is a difference between being 'an inventor' versus being an 'entrepreneur.' To that end, I would focus on a different package of services, designed to train entrepreneurs in specific business proficiencies, e.g. sales; how to recruit talent.*
 - *Entrepreneurs can be good at 'technology, markets, products and sales' but typically are NOT good at Finance or Legal, e.g. GAAP accounting rules. [The incubator] should bring in top national talent who can really help start-ups. In the software area, I would try to get people like Gartner, Frost & Sullivan, Forrester Research, Dunn & Bradstreet—analyst firms to help analyze what state the market is in and to help the entrepreneurs focus on it.*
 - *I would like to see an 'Incubator Day' set up to let tenants do Show & Tell for NDSU, department by department. It is important for the Incubator [and Park] to help drive talent our way. Someone should actively help kids apply for internships with incubator companies. We need a proactive approach to helping the companies. Bring in finance people who can teach the entrepreneurs.*
 - *Faculty cannot do this. We need an 'Entrepreneur-in-Residence' model. It is a choice of what to spend the available dollars on [for staffing, versus consultants, etc.]. Business is a field of land mines. It needs people who can help guide the entrepreneur through that field of land mines.*

11—ASSESSMENT: CONCLUSIONS AND STRATEGIC DIRECTIONS

In this final Section 11, the consultant team's *Conclusions* are presented, paired with related *Strategic Directions*. The latter are what their name suggests: They are **possible directions for future strategy**, arising from the Phase 1 Assessment. They need to be vetted and refined by NDSU principals. It was the plan that these *Strategic Directions* would create an initial straw man / framework of ideas that then would make the Phase 2 planning dialogue more focused and productive.

The *Conclusions* are numbered "C.x" and shown in BLUE.

The *Strategic Directions* are numbered "S.x" and shown in GREEN.

NDSU Institutional Contexts for *Research and Innovation*

1—Vision for the Future

C.1. NDSU is an institution with a wonderful past and promising present, but there is little evidence of a commonly-understood vision for the future.

S.1. The *Research and Innovation* strategy that is contemplated currently may serve to provide a common vision that stakeholders will understand and embrace. Also, it may provide a platform that President Bresciani could choose to leverage—now or later—to add related big strategies for enrollment targets, a faculty expansion program, and academic program development.

NDSU is an extremely interesting institution with many wonderful stories and accomplishments. Important progress was made in recent decades and additional progress in many areas is occurring under President Bresciani's leadership. Yet, based on collective input from 109 interviewees, we found no evidence that stakeholders can articulate the institution's clear strategic priorities for the next decade or more of growth and achievement.

The moment is a good one. The State's current economic strength and its extraordinary commitments to funding its higher education institutions and its entrepreneurs open the opportunity to design and pursue a bold 21st century public research university vision.

EKA is mindful that our assignment is Phase 1 of a planning study that is focused **only** on *Research and Innovation*. However, that subject obviously connects to the entire academic enterprise; the edges are hard to define. Thus, the President has the option of determining how this planning perhaps might be leveraged, to support a broader, disciplined dialogue that would connect new *Research and Innovation* strategies to a just a few more big strategic questions—like planning enrollment targets, a faculty growth plan, and academic program development strategies.

EKA has very definite points of view about how universities should (and should not) do strategic planning. We will share and apply these planning principles in development of the Phase 2 planning process.

2—Matching Infrastructure to the Size of the Institution

C.2 The scale of NDSU’s production functions today and the scale of its internal administrative / support infrastructure to support those production functions are mismatched.

S.2. NDSU could create a specific *Infrastructure Investment Plan* to grow NDSU support functions and resources to current and projected scale of enrollments and research programs. Such a *Plan* could be funded with a combination of (1) smart internal budget reallocations and (2) some sensible, targeted requests to the State for specific items—especially for one-time upgrade investments.

This is a growing pains issue: In general, the scale of NDSU’s internal infrastructure to support faculty and programs looks, to us, like that of a smaller institution. Historical underfunding, before the current positive funding environment and the new funding formula, likely is the reason.

NDSU now needs internal infrastructure to support growth and excellence in academic/research programs that is more consistent with the institution’s current size / scale. Catch-up is needed at least in academic and research administration, information systems, obsolete facilities, and faculty support / development—and perhaps in other areas that EKA did not review. Then, pursuit of an even larger future vision of accomplishments and service to the State will require additional scaling of structural capacity.

A proposed *Infrastructure Investment Plan* would be separate from, and in addition to, specific funding initiatives for academic / research program (and faculty) investments. NDSU should define its major infrastructure deficiencies, estimate a multi-year investment cost, and then organize the needed resources—from a combination of internal reallocations and new resources. Much of what is needed may be possible to find in smart budget reallocations.

NDSU could make the case to the State that, if the goal now is to make North Dakota’s universities central to economic growth, it would be reasonable to provide some one-time, targeted infusions of funding, to help NDSU catch up with other peer research universities in how it operates. For example, we understand that accumulated deferred maintenance is one of the big infrastructure problems; antiquated IT systems are another; and according to deans, library databases are needed. Unlike permanent staff positions, which should be funded from internal reallocations, perhaps the State would be willing to provide some specific infusions of funding (perhaps in a three-year program), to help fix deficiencies that are more or less *one-time* costs. Some peer data may need to be developed in Phase 2 planning, if there will be requests to the state for targeted improvements.

3—New Strategic Resource Allocation Approaches

C.3 In resource allocation, there is no evidence of a mechanism for funding *institution-level* program priorities. Some stakeholders characterize resource allocation as overly *democratic*.

S.3 NDSU could create a special *Strategic Investment Fund* in the range of \$100MM to \$200MM, from which to fund programmatic priorities (including faculty positions) that will emerge in the *Research and Innovation Strategic Plan*.

How NDSU Looks to Us as Outsiders: A Folsy Analogy

Anyone who has raised puppies knows that young puppies often have nearly adult-sized ears and paws, with puppy-sized bodies. Eventually, the body grows to fit the ears and paws.

NDSU is a recently-small institution that has been growing up fast—so much so that it actually has gone through a full mission transformation.

Growth in enrollments and research has not been matched by growth in internal infrastructure and management systems—including policy, culture, staffing levels, modernization of facilities, IT systems, etc.—by which to organize, plan, support, and manage the programs.

So, to continue the puppy analogy, enrollments and research programs are the ears and paws. The administrative and support infrastructure is the yet-to-grow body.



Long-time practitioners of democratic and political resource allocation approaches, universities increasingly are moving toward making at least some selective, strategic investments—just as they now are beginning to write strategic plans that actually articulate priorities. At NDSU, interviewees commented on across-the-board resource allocation. Also, interviewees suggested that NDSU needs to raise a research endowment; \$100MM was mentioned. This same idea was an outcome and recommendation of the 2011 *Strategic Review* of the RTP.

It is EKA's view that the idea of special funds is correct, but setting up an endowment or special funds **without defining the strategic priorities** would not be ideal.

Also, it is possible to develop a *Strategic Investment Fund* with a combination of operating funds, state grants, and gifts. It does not have to be purely an endowment.

Universities naturally have various resource allocation approaches by which they fund core budgets of colleges and major program units. Now, in addition, many are creating secondary funding models or additional, **separate pools of funding for top-down, institution-level strategic priorities**. Often, this funding is tied to research strategies, faculty expansion, and ways to incentivize multidisciplinary programs. Two examples:

- **Ohio University** has set aside a \$100MM fund (from operating funds) that will be replenished continuously, for making strategic investments in multidisciplinary innovation strategy programs that cut across colleges. Money will be applied to faculty hires and other program needs. The deans are working together now, in a process, to define the candidate areas for these investments.
- **Dartmouth College** has a similar, new program, also with \$100MM. In Dartmouth's case, the funding is from a donor. The College has set up an internal competitive process. The focus, like Ohio's, is multidisciplinary, big-problem research / innovation.

4—Faculty / Academic Culture

C.4 NDSU's faculty / academic culture has begun to evolve into that of a research university, but there are still very traditional elements and points of tension that may impede progress toward *Research and Innovation* growth.

S.4 Although culture evolution is both inevitable and already underway, change in universities usually proceeds with all the deliberate speed of a glacier. NDSU's leadership can accelerate this evolution—to *broaden faculty views of mission—by a combination of messaging, policy, and rewards / incentives.*

There are sub-issues that together form the institutional culture, including:

- **Academic Silos**, for example, evidenced by few interdisciplinary graduate programs
- **Promotion / Tenure** (and tensions among research-performing and teaching faculty).

Nothing about this cultural factor is unusual, as these are traditional and long-standing elements of academic culture. But we sense that some of it, like silo behavior, is a bit more exaggerated (or persisting longer) at NDSU than elsewhere. Other research universities with more experience in innovation activities have been working longer at changing cultural dynamics; perhaps what EKA has noted is that NDSU is not changing as much or as quickly as other institutions are. To some extent, the infusion of a large number of new research-oriented faculty (if *Research and Innovation* strategies are successful) will continue to modify the NDSU faculty culture. That already is the case (although it is expressed as a *toxic culture gap* at present).

All Universities Have this Culture Challenge

EKA recently interviewed the Chair of the Faculty Senate in a large, public research university in the Midwest, with several program and size characteristics that are similar to NDSU's.

The Senate Chair asserted vehemently that the institution's efforts to spin off and grow companies and to work with company partners are *categorically in opposition to the University's mission*.

Of course, in that same university, there are many faculty members who are avidly working on innovation projects and with industry partners.

So, we are in a time of great change. It is impossible that NDSU would not have a wide range of faculty attitudes on the matter of how innovation, entrepreneurship, industry partnerships, and economic development fit NDSU's mission.

Agriculture was born that way. For the rest of the university, all this is new. For some, it is a challenge to their core beliefs about the Academy.

The President, Provost, VPR, and Deans can craft and consistently deliver the *message* about how *varying* faculty accomplishments can be recognized in an institution that wants to focus on both undergraduate education and *Research and Innovation*. Even more, these two foci are not incompatible; they can and should be connected.

5—Collaboration and Partnerships

C.5 NDSU does not currently have a high enough *Partnering IQ*—by which we mean, collectively, the organization structures, staffing, policies, information tools, business processes, outreach mechanisms, and attitudes for engaging productively in a wide range of collaborations.

S.5 NDSU needs to improve its institutional skills in partnering with other institutions, governments, non-profits, and private companies. At least two elements needed are: (1) a web-based *portal* function to make information / access to NDSU faculty and other resources easier; and (2) a staffed and sophisticated *Partnership Development Program*.

In this conclusion, we mean partnerships in many definitions:

- Partnerships, internally, among colleges and departments of NDSU
- Partnerships with UND and other universities/colleges in North Dakota
- National partnerships with other universities, where applicable due to the subject
- Partnerships with business, industry, social service agencies, state/local government, and community organizations.

There are positive developments. The President's initiative—*Community Partnerships Program* is an excellent step in the right direction—and we also like the flags flown together as a PR / Marketing aspect of this program. We also understand that the Chief Development Officer is working on this general problem of making the University more open to partnerships. The RTP has significant relationships with companies. The Office of Research has a position for Corporate Relations to fill and is making this a priority.

Yet, with the exception of Agriculture, *partnership development* has not been, and is not yet, a particular strength of NDSU. The practical impact of low *Partnering IQ* is that NDSU is well-positioned neither to take advantages of opportunities that are proposed to the University by others nor to make its own opportunities via its outreach to others. Interviewees described cases in which the University did not respond (fully or promptly) to proposals from various potential partners.

Portal Function—Website

By *web portal*, we mean organizing an *Asset Inventory* of programs and services of potential interest to business, industry, and community organizations, and making information about these readily findable on NDSU's web page. This is an approach that is gaining in popularity. Exhibit 10 provides two examples—NC State University and University of Maryland.

Partnership Development Program—People / Office

By *Partnership Development Program*, we mean scaled-up corporate relations and business development, with a suitably-scaled professional staff that is knowledgeable about faculty work and institutional resources, and empowered with various tools to define terms for various kinds of collaborations—not just licensing. To make initial access easier for outside parties who want to connect with NDSU, this needs this to be a *one-stop-shop* function—a *front door*. (Agriculture has had this for 150 years—the Extension Service and its agents.)

Nomenclature

We prefer the term *partnership development* to *corporate relations* because, in the ideal, some of the partnerships also will be with governmental or community-based agencies, or industry associations, or other universities.

For example, NC State University has been devoted to the practice of *Partnership Development* as its main innovation outreach strategy and its marketing for occupancy in its Centennial Campus (research park) since the 1990s. Today, NC State has evolved this to a *Partnership Concierge* function (on the website), leading to the staff.

This is not a position to fill; it is an entire program that needs to be designed. NDSU must designate the offices and personnel who are responsible for intake and then, importantly, for follow through. There can be more than one locus—so long as there is close coordination. The Office of Research, the RTP, Institutional Advancement, and the Provost’s Office are possible loci. In addition, there always will be very high-level inquiries or proposals that will come directly to the President.

Some aspects of a *Partnership Development Program*, as we envision it:

- **Business-Friendliness in Making Arrangements.** NDSU needs to re-organize and make business-friendly its policies and business practices with respect to forming partnerships—whether by contract, MOUs, or other formal/informal arrangements. There needs to be a standard to be met for response times, when a query or proposal has been made to the University. One of the most frequent complaints businesses have (not just in NDSU’s case) is: *“We cannot get an answer, and it’s been three years.”*
- **Policy Audit and Updates.** NDSU needs to separate internal policies from state statutes and policies and address its own policies directly, while seeking changes needed at the state level. There already is ongoing dialogue on the matter of Intellectual Property (IP).
- **Responsibility for Follow-Through.** The University needs mechanisms for following up on partner activities with those to whom the day-to-day work is delegated—to make sure that follow-through on obligations actually occurs. There is no easier way for a university to earn a hit to its good reputation than making a commitment and then not fulfilling it. But, we know this happens. Commitments require monitoring.
- **Message, Values, and Culture.** The President, Provost, VPR and deans can exhort by setting the message and by doing their parts administratively to provide business processes for partnerships. But executing on content in partnerships is in the domain of faculty and their students. Thus, to make partnerships with business, industry, government, and community organizations a priority and to carry out such partnerships competently—in a way that enhances the University’s reputation—involves a *change in the values and culture of the faculty*—and the *incentive/reward system* to which they respond. That comes back to departmental norms for *promotion and tenure*, and *larger ways of expressing what NDSU values in its culture*.
- **New, Expanded Metrics of Accomplishment.** Finally, new metrics are needed to capture progress and accomplishments in endeavors where the outcomes depend not solely on what NDSU does, but on what the partnership achieves.

6—Entrepreneurship Education, Experiential Education, International Experiences, and Undergraduate Research

- C.6 Four education modes are included commonly in *University Innovation Strategies*. Of these, NDSU already is focused on *International Education* and *Undergraduate Research*, but the University does not offer *Entrepreneurship Education* and its *Experiential Education* programming may be minimal.
- S.6 *Entrepreneurship Education* should be offered at NDSU and *Experiential Education* should be considered for sensible expansion. *International Education* and *Undergraduate Research* programs, already priorities, should be strongly encouraged.

Although these are student programs in the Academic Affairs domain, these also are programs that are associated routinely with *Research and Innovation* strategies, because:

- They respond to needs of mature companies, which prefer to hire graduates with some work experience and often prefer graduates with some international experience.
- They are so essential to our economy’s enormous emphasis on entrepreneurship and innovation, that they could be considered a core part of a professional education.
- They respond to obvious needs for skills to function in a global economy. Countries of high interest include China, Brazil, India, and Canada.

We heard in interviews about internship programs, but we do not have the impression that Experiential Education is a big focus. We did not investigate the extent to which students are going abroad for studies, but this is an area of current focus and expansion, we are told.

These programs have become ubiquitous. In the case of *Entrepreneurship Education*, the programs even are ranked. (See *Princeton Review* rankings, provided as Exhibit 11).

At present, NDSU students are able to enroll (online) in UND’s Entrepreneurship program/courses. Few do, we are told. Ideally, NDSU’s College of Business should lead development of curriculum in *Entrepreneurship Education*, with other colleges as partners. NDSU should consider creating at least a minor for students majoring in all subjects and a certificate program. There are any number of excellent models that can be adapted.

7—Peer Institutions

EKA-Proposed 9 Peers

Current Peers

- University of Arkansas, Fayetteville
- Kansas State University
- Auburn University

Aspirational Peers

- Mississippi State University
- Iowa State University
- Oregon State University
- Louisiana State University-Baton Rouge
- University of Georgia
- University of Kentucky

Three Institutions Worth Looking at for Program Models / Ideas

- NC State University
- Virginia Tech
- Washington State University

C.7. For NDSU, in the past, the NDUS (System Office) has tracked a group of 15 peer institutions for studies and comparisons, some of which may not be ideal institutions for benchmarking research goals and strategies.

S.7. NDSU should consider using a different 9-institution peer group (based on an *NDSU Similarity Index*) for baseline comparisons and for quantifying goals for *Research and Innovation*.

Early in this Assessment, we used the peer group list provided by the Office of Institutional Research and Analysis (OIRA), and a second group—the Upper Great Plains peers—to assess NDSU’s research performance. We learned that the 15 peers provided by OIRA are peers that the NDUS (System Office) has used in comparisons in the past; the peer selection has not been updated for a while.

We then performed an analysis to find institutions whose research strengths better mirror those of NDSU. That yielded a different peer group.

NDSU should consider adopting the new 9-peer group, or perhaps should extend the analysis to include other factors. Either way, a new peer group should be adopted.

Research and Innovation Strategies

8—Research Performance—and Elements for a New Strategic Plan

- C.8 NDSU’s performance in research presents a mixed picture of several positives and a few concerns. Underlying everything is a strategy shift from reliance on earmarks (and semi-external centers, not populated by faculty) to a faculty-centric research growth trajectory. This shift changes everything and it is a major reason for creating a new *Research and Innovation Strategic Plan*.
- S.8 For long-term growth and sustainability of the *Research and Innovation* mission, NDSU needs a new *Research and Innovation Strategic Plan* with:
- Quantified growth targets / goals, with metrics
 - Selected priority areas of multidisciplinary research for special investments
 - Strategies for enhancing performance, from grant acquisition to innovation, including such measures as more faculty-generated grant proposals, strategic faculty hires, some larger-scale proposals; enhanced federal funding; special funds for supporting grants and a proof-of-concept fund, and a new initiatives to expand industry R&D contracts (*All the actual ideas need to be developed in Phase 2.*)
 - Strengthening of the *Research and Innovation* organization and capacities— personnel, IT systems, operating resources, in order to support grant development.

Initial, Not Definitive Ideas for the Four Main Elements of *Research and Innovation* Strategy

Each of these four required *Strategic Plan* elements is the subject of additional *Conclusions and Strategic Directions*, numbered 9 through 12, below.

Research Performance

NDSU’s growth, in the 2000s, in research expenditures (performance) has been strong, from \$102MM in 2004 to \$134MM in 2011. By 2010, NDSU’s research performance was such that the Carnegie Commission designated the University as a Research University / Very High Research (one of 108). Further, a longer view of research growth reveals total growth of 677 percent from 1985 to 2011. In 1985, the research expenditures figure was only \$17.5MM—a level common for a public regional teaching institution. **This is nothing short of a mission transformation and institutional reinvention.**

Earmark funding, thanks to Senator Byron Dorgan, has been a great positive accomplishment, although now it is presenting a sustainability challenge—for CNSE and CCAST. And, statistics presented in this report show that NDSU has a significantly higher portion of its funding from State / Local sources than do its peers. The State is being generous in its research investments—particularly its funding of Agriculture research.

There are concerns:

- There were several ND Centers of Excellence proposed and funded; these have produced varied results—sustainability has been a concern.
- NDSU’s federally-sponsored R&D grew 17 percent between 2004 and 2011, while federal R&D expenditures by *All Institutions* included in the NSF HERD survey increased 44 percent in the same time period.
- NDSU’s lack of industry R&D relationships is evidenced by the fact that the University’s R&D expenditures funded from Business / Industry sources was 0.43 percent; in the same year, 2011, the average for all institutions was in the range of 4 percent; and top performing institutions in industry sponsorship range from 10 to 20 percent of total, and even more for some outliers. The average for NDSU’s peer groups was about 4 percent. NDSU clearly underperforms in acquiring private sector R&D funding.

Change in Research Growth Strategy

As we understand it, under President Bresciani, NDSU is to move into a new phase of research growth and development, with greater focus on the more typical activity of faculty-led research. We further understand that Dr. Rusch was appointed with this different mandate. With respect to CNSE and CCAST, the VPR believes it is her responsibility to preserve and strengthen these two Centers, but also to connect them to the academic units. At the same time, she is to build faculty capacity for producing research. The latter is largely a new priority.

In EKA's opinion, it was a plausible idea that research growth could be acquired faster with the CNSE and CCAST strategies. And, clearly, CNSE and CCAST both are valuable program assets that the University needs to nurture. Also, the successful Research Park—with an interesting mix of university units; incubator / start-ups; and mature companies was bound up with the earmark strategy—and the Park has created extremely good outcomes.

But, it also is imperative that the longer-range strategy must produce research with faculty assets—not instead of CNSE and CCAST. Earmark funding is most effective when paired with a plan for long-term sustainability.

9—Quantified Goals

- C.9 Quantified goals for key research and innovation metrics are important, although the time horizon for their achievement can be flexible. Numeric targets are useful for focusing the attention of the many stakeholders who must participate in carrying out strategies. People relate to numeric targets.**
- S.9 Instead of proposing specific quantified goals / targets, EKA suggests that this should be done in Phase 2—with further review of the data and discussion. For now, examples of what we mean are provided.**

Examples are as follows:

- **Total Research Expenditure Rankings.** Achieve an overall *Non-Medical Research Expenditures* rank of 50th or higher. In 2011, NDSU's Non-Medical Research rank was 94.th The range of the 9 proposed peers is a low rank of 102 and a high rank of 32. Or, set a target rank for *Total Research Expenditures*, e.g. from 128 to top 100, or higher (later).
- **Dollar Targets.** Or, set dollar targets—total, by disciplines, and by funding source
- **Agriculture.** Achieve top 10 (or top five?) in Agriculture. NDSU was 18th in Agriculture in 2011 and 15th in 2012. This is a huge strength of North Dakota and NDSU. It also could be a goal to target a certain dollar level or rank in *federal* Agriculture funding.
- **Business Funding.** Achieve four (4) percent of total research expenditures from business / industry funding, to come into alignment with peers and *All Institutions*.
- **Business R&D Agreements.** One could set a target for a growing number of agreements (of all types, not just licenses) with businesses.
- **Growth of Sales and Employment in Companies Generated from NDSU.** One could establish some targets by which to measure impact of NDSU-born start-ups.

10—Priority Areas of Multidisciplinary Research for Special Investments

C.10 While there are areas of acknowledged strengths, there do not seem to be any content areas that rise to the level of university-level, agreed-upon strategic research priorities. And there is little focus on multidisciplinary research areas.

S.10.A As many other universities are doing now, NDSU should, through a process that this Assessment sets in motion, identify a few multidisciplinary, problem-focused areas (*university strategic research priorities*) in which to bring together faculty from across the University and in which to align significant new faculty hiring and other special investments.

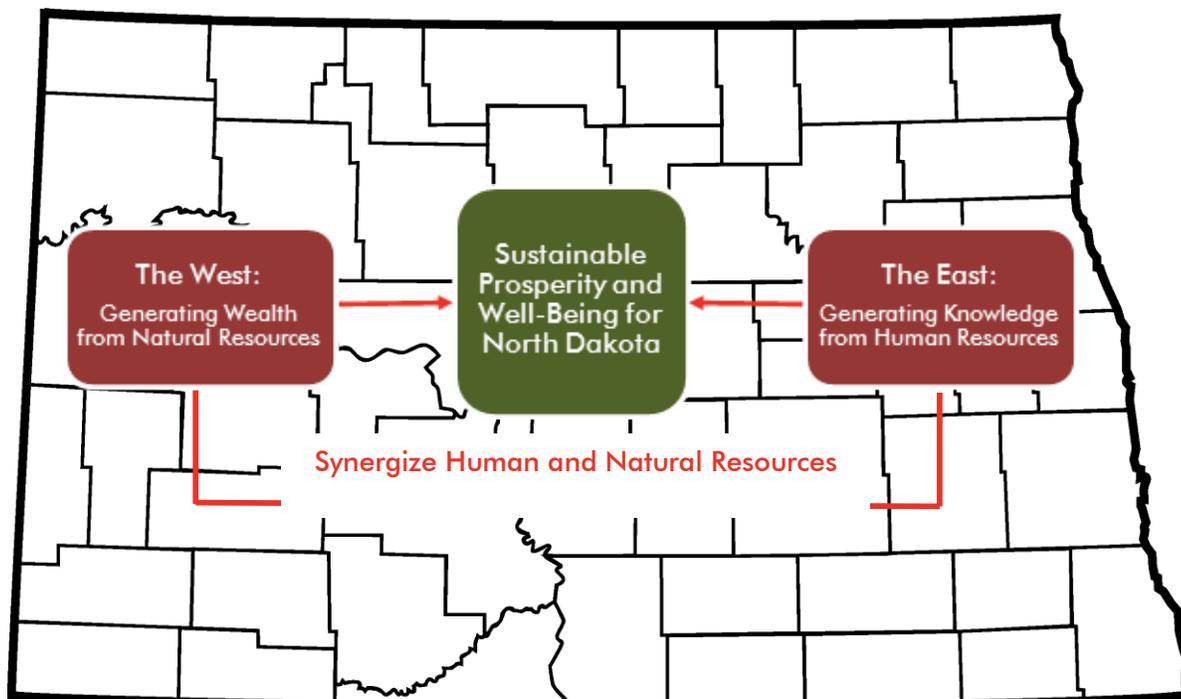
It is becoming common for universities to select a few areas of strength, matched with big needs (state, regional, national, and global)—in which to focus growth of their expertise and competitiveness. Usually, these are multidisciplinary and problem-focused.

NDSU should join this growing trend. These decisions must result from a combination of hard analysis and informed judgments. It requires data, then dialogue. It requires a university-level focus.

In doing this for *Research and Innovation*, it could follow that related interdisciplinary degree programs, associated with the priority areas would be developed. Some of these might be interdisciplinary Professional Science Masters (PSM) programs; others would be at the doctoral level.

S.10.B One of the ideas that emerged—*Meeting the Bakken Region Challenges* (Energy, Environment, Industry, Economy, Society, Communities) is so compelling to EKA that we further suggest that it should be the first and biggest idea considered.

We think of it as the *North Dakota East + West Strategy*.



A Good Process Required

It was our Phase 1 objective to identify initial candidates for research priority areas. The list is provided below. There is great opportunity for NDSU to now subject these ideas to a fuller analysis and dialogue—to ultimately select a few high priorities. As we have done with other clients, we strongly urge NDSU to not let this be political or impressionistic. The best selection of priorities will require both hard data and informed dialogue to match strengths with external needs, to determine where greatest impact can be made, and to define investment requirements. A process for all this would be included in Phase 2.

We might propose an approach we have used elsewhere, in which some *Big Ideas* would provide the initial framework, and then some more discreetly-defined *Program Niches* would be selected. In any case, there would need to be:

- Participation of the academic leadership and key faculty of the University
- Input from the correct external parties/stakeholders
- A data-driven analysis of *candidate* areas, to select the priorities.

Initial Candidates

We have grouped the specific suggestions or candidates into three areas, two of which might be the initial *Big Ideas*, within which niches could be developed:

- Energy and Environment
- Life Sciences—Agriculture and Biosciences
- Other Technologies.

Energy and Environment

- Biofuels/Sustainable Energy
- Sustainable Materials Science—e.g., photo-voltaics, sensors, new greener materials (Sustainable Materials is already the only EPSCoR cluster at NDSU.)
- Energy, Environment, and Society (a “trifecta”)
- Managing Growth in Western North Dakota. Several interviewees brought this up in various ways. The following is a consolidated summary:
 - Social Issues Involved in Rapid Growth: Child care, housing, crime (The Criminal Justice Program currently is studying crime and policing issues in Western North Dakota.)
 - Urban Planning and Community Development—Architecture, Social Sciences, etc.
 - Technical Challenges: Pipeline, environmental effects, especially water challenges
 - “Green” Chemicals
 - Improved oil field chemicals and safety
 - Sensors for Corrosion and Pipelines
 - Energy/Water Nexus—People, Land, Environment
 - Water Treatment/Pollution in Wells
 - Roads Destruction—Transportation Solutions
 - Oil Field Materials—Texas has the lead at the moment
 - Water Quality/Optimal Spacing of Wells

Relationships in this realm were the subject of comments:

- UND already is active in Western North Dakota via its Center for Oil / Gas Engineering
- Connections with Canada were mentioned. On the other hand, North Dakota has shale oil (fracking), while Alberta has tar sands (extraction). They are not the same energy sources and do not have the same technical problems. (EKA Note: Yes, but they may have many of the same social, health care, and community challenges.)

- There could be developed a relationship with Dickinson University, which has a Center of Excellence to train personnel in the oil and gas field

Life Sciences, Agriculture, Biosciences

- Bio-Systems (at intersection of biology, informatics, engineering, chemistry, pharmacology, materials science), e.g., replacement of human tissue). (But, with no Medical School, this might not be a good fit.)
- Food Systems and Food Security (Agriculture + Informatics + Materials Science, etc.)
- Health Care Delivery (e.g. Public Health + Food/Nutrition+ Informatics + Social Sciences)
- Precision Agriculture, including designing new plant strains and the instrumentation or applications related to growing these crops efficiently
- Feed the World
 - The Provost sees big opportunities internationally in this realm, and believes the focus should be on bio-genomics/ bioinformatics/ plant pathology (need a genome browser). He wants to assemble 100 universities around the world that are like-minded, to collaborate
 - NDSU is currently working on a proposal for a Global Institute for Food Science & International Agriculture—and will submit this to the State

Other Technologies

- Nanotechnology
- UAVs (Engineering + Materials + Ethical/Social Issues)—UND is or will be a partner, as it has components of this expertise. NDSU has capabilities for applications
- Disaster Planning / Emergency Management. This suggested area is one about which there were many comments:
 - NDSU has the first PhD program in the world in Emergency Management
 - Center for Disaster Studies—ability to perform GIS overlays, e.g. study potential drift for hazardous materials
 - Flooding is an immense local concern—thus fitting for the University to address:
 - The #1 priority of the Fargo Chamber of Commerce is flood protection solutions. This is the major challenge for attracting and retaining companies
 - John Deere testified to the State’s legislature that a catastrophic flood could shut down worldwide operations
 - The Mayor of Fargo also highlighted flooding as his #1 issue.

EKA’s Favorites

Some of EKA’s favorite candidate niches that arose from the interviews are:

- **Energy, Environment, Society**
 - *East + West for North Dakota:* Solving Challenges of the Bakken Region
 - Sustainable Materials—another Possible Niche
 - Disaster / Emergency Management—a special Niche should be Flood Prevention and Management (of interest to Fargo, as well as communities world-wide)
- **Food Systems and Security**
 - One niche is Precision Agriculture; there may be others
- **Health Care Delivery Models**
 - Niche is Delivery Technologies for Rural Populations, e.g., Telemedicine

11—Strategies for Research and Innovation Growth / Sustainability

There will need to be developed a range of strategies to promote growth of research programs and performance. It is beyond the Phase 1 analysis to identify all of them. These ideas will need to be advanced and vetted and prioritized in Phase 2. For now, there are a few key ideas provided here.

Preservation and Advancement of CNSE and CCAST

- C.11.A CNSE and CCAST are critical core capacities for many areas of current and future research. Their presence, as a result of the earmark funding, is a great advantage. We understand that funding pressures now are being addressed. Plans are being developed for a sustainable funding and revenue model.
- S.11.A EKA concurs and believes that securing the future capabilities and growth of these two Centers is a high priority for NDSU.

Two Strategic Resources of the VPR—Operating Funds and Assignable Space

- C.11.B The University's current model for allocating Indirect Cost Recovery (ICR) funds may be a barrier to moving forward with new investments, and EKA believes it is outside typical practice. If this current practice cannot be changed, then some other source of funding should be found, for the VPR to use to support faculty in general and to specifically incentivize multidisciplinary grants.
- S.11.B NDSU should re-evaluate its ICR distribution to the Colleges and consider re-directing a reasonable portion of these funds to the Office of Research. Or, a reasonable annual funding requirement should be determined, and resources reallocated to this purpose from other budget sources.
- C.11.C In order to make large, multidisciplinary grants possible, there needs to be space that is not controlled by the deans. At present, the VPR has available space that she can assign in the Research I / II building(s).
- S.11.C When the existing available space is absorbed, there will need to be another means of creating centrally-controlled space, to retain the ability to place new grant projects that are not within individual colleges, or for which the colleges do not have space available. Multi-tenant buildings in the RTP are a good solution for meeting this ongoing need.

Typically, in other institutions that have greatly grown their research programs, the VPR has two strategic resources with which to incentivize research: (1) space (especially labs) that he / she controls and can assign (without fighting the deans) and (2) ICR funds or other funds that he / she controls, with which to seed grant development, especially when more than one college / department is involved.

It is simply not viable for the VPR to have no funds at all with which to incentivize and support scaled-up or multidisciplinary research initiatives—the very kind that the Phase 2 planning is likely to lead to. EKA believes that we would find that 42 percent of ICR distributed to academic units is likely high. So, some share of the 42 percent currently returned to the academic units could be re-directed to the VPR. Some investigation of peer policies might be useful, in Phase 2.

In the matter of sustaining a supply of centrally-controlled research / lab space, expansion of multi-tenant space in the RTP will be one obvious solution.

C.11.D We found no evidence that there is funding available currently to NDSU innovators, for *proof-of concept*, for initial vetting of new ideas.

S.11.D One of the strategies for improving innovation outcomes from university-born ideas should be creation of a *Proof-of-Concept Fund*, administered in the Office of Research, with outside technical advisors.

Between research funding and funding available to start companies or for companies with new products, there is a well-known gap, sometimes called the *Valley of Death*. Many places have funds in place for testing commercial viability of new ideas. Often, small amounts of funding can make a difference—for product / prototype development, market analysis, or aspects of early product development.

12—Right-Sizing the Office of Research

C.12 The Office of Research infrastructure is small for current activity, and certainly for planned growth.

S.12 NDSU must approximate the research and innovation organization / infrastructure of peers, with enhanced staffing and modern IT systems, and a reasonable level of operating funds to spend on faculty development and grant development. An Organization Audit and a plan for required right-sizing is needed. This can be joined with, or independent of, the *Infrastructure Improvement Plan* that is recommended as S.2, above.

It appears to EKA that the VPR operation was not built to match those at other universities, where competitive grants have been the main focus of attention. With heavy focus on quasi-external centers, it may be that the Office of Research was right-sized. With the earmarks, it mattered less how many successful competitive grants were garnered. (All this is in the larger context, discussed in Section 6. Overall, NDSU’s internal administrative and support infrastructure has not grown to match the size of its enrollments and programs.)

From our general knowledge of other universities, we conclude that, if / as NDSU now changes to a strategy that will focus on internal growth of faculty-led research programs, then, the current Office of Research staffing level is inadequate. This includes the need for more staffing for federal relations, pre-grant development, technology transfer, and post-award compliance, as well as strategy / leadership. We understand, also that IT systems are antiquated and inadequate.

We also recommend, above, a much expanded **Partnership Development Program**. While other offices may play roles, this Program likely should be led and coordinated from the Office of Research. It will require staff expansion.

An Organization Audit is Needed

In this Phase 1 Assessment, we did not collect original data to perform a normative organizational comparison with peer universities that would include position counts, as well as the nature of positions. Our conclusion is based largely on EKA’s general knowledge of other research universities and on feedback from many of the NDSU interviews.

Thus, Phase 2 of this planning should include a detailed Organization Audit, with comparative data for selected peers acquired in a survey. The Audit will center on the Office of Research, but it may need to include selective aspects of related NDSU functions, and the two related corporate entities. Then, based on specific organization changes and IT infrastructure projects, costs can be estimated and a sensible expansion plan carried out.

The Research and Technology Park

13—RTP Successes as Mirror Image of NDSU’s Successes

- C.13 Just as the University has been exceptionally successful in transforming itself into a research institution, NDSU’ RTP has been very successful in the metrics typically applied to university research parks and in its overall economic impact.
- S.13 It would be appropriate to celebrate NDSU’s and RTP’s successes to date, perhaps at the conclusion of this NDSU / NDSU RTP planning—in a communications program that may include a signature event, and in connection with announcing new *Research and Innovation* / RTP strategies.

Research parks should bring together university research functions with large corporate partners, regional gazelle companies, and true start-ups, some of which are driven by university faculty and students and some of which come from the community / region. Provision of services to start-ups and young companies provide essential foundations for any true research park. Land and building development are not the goals, but they are critical tools.

In EKA’s Assessment, we conclude that the RTP has accomplished most of the traditional research park aims, and it has done so in a short period of time when compared to the take-off trajectory of peer parks. The exception is that relationship-building between the Park’s occupants and the University was not a major focus, nor is it a major accomplishment to date.

The NDSU RTP now has 418,000 SF of developed space. Additionally, the Park’s Incubator has spawned four graduates that have remained in Fargo and are experiencing rapid growth trajectories: Appareo Systems, which now occupies its own 40,000 SF building; plus Pedigree Technologies, Myriad Devices and Intelligent Insights. These rapidly growing, North Dakota-grown companies represent poster children for the Park’s incubation program. There is a good current mix of companies in the Incubator. Employment and other measures of the Park’s ROI to North Dakota also are significant.

14—From Program Separation to Program Integration

- C.14 The presence of CNSE and CCAST as major NDSU elements in the RTP perhaps has contributed to the general sense among NDSU faculty and deans that RTP is an enterprise that has been programmatically completely separate from NDSU. With CNSE and CCAST, the Park mirrored NDSU’s strategy of the 2000s for growing research, at least in part, without faculty involved. Given a change in NDSU’s research growth strategy and given contemporary best practices, this (real or perceived) *separateness* of the Park from NDSU now is a weakness.
- S.14 As NDSU and its RTP create a new Strategic Plan for *Research and Innovation*, that Plan will emphasize that the RTP is fully integrated into the programs of NDSU’s *Research and Innovation* system. To help change past perceptions, RTP should become thought of physically as a part of NDSU’s campus—and with a name such as *Innovation Partnerships Campus at NDSU*. A name change in this vein could help with advancing integration activities, and in re-branding.

Two Examples of Re-Branding

Colorado Bioscience Park, in Aurora, Colorado, has been re-branded recently as Fitzsimons Life Sciences District

Piedmont Triad Research Park, sponsored now by Wake Forest Health Sciences now is called Wake Forest Innovation Quarter

Notice abandonment of the “research park” nomenclature

These *places* should emerge as *knowledge communities*—with dynamic relationships among the university and company functions and personnel. In contemporary best practices, research parks are a *place-based element* of the university's *innovation system*—not separate real estate sites.

Some revisions may be called for in the Park's current vision statement, to more clearly reflect the connections.

FROM THE CURRENT: The NDSU Research & Technology Park serves as a catalyst for innovation in science and technology leading to discoveries that contribute to North Dakota's economic development.

TO SOMETHING LIKE: The Innovation Partnerships Campus at NDSU is a community of university, government, and corporate innovators—where education, training, R&D, and business development partnerships are cultivated and carried out for the benefit of the region and the State.

Both a new name and a new vision statement can be discussed further in Phase 2.

15—A New Physical Design—for Community of Innovation

- C.15 The RTP's physical layout, with its lack of connections among buildings, does not provide visitors a *sense of place*—and does not contribute to development of an integrated *knowledge community*. The RTP is not a dynamic setting, and it does not have the feel of a university campus—which we believe it is, or should be. Among the RTP's strengths, this is the greatest single weakness.
- S.15 RTP's 2008 Master Plan was a move in the right direction—in articulating principles. If the 2008 Master Plan does not provide enough specific guidance for *how to site future buildings and create some shared amenities, shared open spaces, and shared parking*, then RTP should do a limited-scope update to that Plan as part of Phase 2—so that imminent building location decisions can be made on a different land plan basis. This may be urgent to do immediately.

The current physical distribution of buildings, with their lack of orientation to streets, open space, or each other, coupled with the over-prominence of parking / autos, does not convey a *sense of place*, or promote a feeling of campus or community.

The RTP should feel like a campus of NDSU. And, consistent with contemporary best practices, it also should feel like a *cool place* where *people want to be*, including students, faculty, entrepreneurs, and business people. Thus, remaining physical development should be aimed at adapting the newest ideas of *place-making for innovation communities*. This includes being pedestrian-friendly and inclusion of amenities and meeting places.

16—New Emphasis on Multi-Tenant Facilities

- C.16 Although RTP has had relatively greater than average success in locating stand-alone corporate facilities, most development in *Innovation Campuses* is of smaller scale. Multi-tenant facilities have become the typical facility type. The RTP Incubator, with a mix of corporate and university occupants, and with a mix of some mature companies with start-ups, actually provides a nearly ideal model for future development of a series of facilities.
- S.16 RTP's next new facility should be a multi-tenant facility, not unlike the present Incubator—perhaps larger in square footage and located either adjacent to the Research I and II buildings or adjacent to the Incubator.

New Name; New Vision Statement

We urge consideration of a new name, to go with re-branding. The one used here is offered as one example—not meant to be definitive.

Similarly, this new vision language is offered as an example.

North Dakota State College of Science

If it is the case that this institution is interested in expansion, its occupancy would be an ideal component around which to plan a next, large multi-tenant building. It would bring new people activity to the campus, including in the evening, and it would help justify some modest food service.

This is a facility type that not only will make it possible to attract corporate partners who cannot justify a stand-alone facility large enough to make sense; it also will be important for growth-in-place of incubating companies. Finally, it also will be very useful to NDSU in locating research grant programs that may need space for a limited period of time. The mix of NDSU research projects with companies in varied stages of maturity in the same facility is a desirable strategy.

17—Development / Expansion of Services, Programs, and Amenities

- C.17** Interviews revealed appreciation for Incubator staff and services, but some mixed reviews of business development support. *Innovation Week* is a well-regarded program. Some companies indicated that programs for bringing company and university personnel together have been limited. There are currently no amenities (e.g. food service) in the RTP.
- S.17** If we are serious about programs, economic activity, and community-building being the aims, with real estate development being only a tool, then it is appropriate for RTP, like any Park, to continue to focus on building, diversifying, and strengthening all aspects of programs. For business development, several models, including entrepreneur-in-residence, can be considered. RTP also should consider a virtual incubation model, offering business development services to Fargo-based and regional companies not located in the RTP, on a membership basis. Events will continue to be important, including informal ones that serve to bring people together. Finally, plans for multi-tenant facilities should include some ground-level amenities, i.e., a small café.

EKA recognizes that the RTP / Incubator staff is very small at present and that additional programming and services will present staffing and financial challenges. We nonetheless believe that these program elements are vital, and that the RTP Board should seek funding solutions for expanding programs and services. Some programs can be provided via NDSU Office of Research staff (hopefully augmented).

18—Tax Free Zone

- C.18** Marketing does not seem to have been a problem for RTP. However, it may be useful to overall economic development to focus some attention on bringing companies from out-of-state and on in-state company expansions.
- S.18** NDSU and NDSU RTP might consider proposing to the State the idea of making NDSU's campuses a special state tax-free zone, for three classes of companies: (1) companies locating or relocating from somewhere not in North Dakota; (2) North Dakota-based companies expanding in North Dakota; and (3) North Dakota start-ups. The idea can be extended to UND and to other higher education institutions.

This idea was proposed by Governor Andrew Cuomo and passed by the Legislature in New York State in 2013. Under this program, called *Start-Up New York*, the State has designated the campuses of all 64 institutions in the State University of New York (SUNY) System as tax-free zones. Vacant land or building space of the institutions and certain non-campus land or buildings are eligible locations. Private institutions also may be eligible locations. Eligible companies must be NY start-ups; relocating from outside New York; or expanding in New York. The program provides a 10-year state tax holiday for qualifying companies. This means: No income tax; no business, corporate, state or local taxes; no sales and property taxes; and no franchise fees. It also intended that these companies will enter into partnerships with the higher education institutions.

Start-Up NY

In New York, Governor Cuomo is taking very seriously the idea that his public higher education institutions are his front line in economic development. He is pairing that idea with the other idea of reducing tax burdens. The result is *StartUpNY*.

Information is available at:
<http://startup.ny.gov/the-new-new-york/>



19—RTP Role in NDSU's *Partnership Development Program*

- C.19 Strategic Direction #S.5, above, strongly urges that NDSU needs to design, staff, and carry out a *Partnership Development Program*. This will require more personnel, effort, and organization than has been applied in the past to cultivation of productive external partnerships.
- S.19 Assuming its full integration with NDSU's *Research and Innovation* strategies, and its natural focus on companies, RTP leadership (Board and staff) should be key resources in carrying out a new *Partnership Development Program*. This means that, working in tandem with the Office of the VPR, RTP staff would not market just land and leases; they would *market partnerships with NDSU*.

Some of these marketing efforts will result in a company locating in RTP. But the difference is this: It is still a "win," even if RTP's efforts do not result in Park occupancy, but do result in a new R&D or education relationship that advances the overall *Research and Innovation* mission. RTP's metrics of success will need to include its roles in non-real estate based accomplishments.

20—RTP Role in Supporting NDSU's Regional Collaborations

- C.20 From Downtown Fargo to the VPP, there are ongoing relationships that are critical to cultivate for vital programmatic, policy, and marketing collaborations. These relationships require high-level administrative time and attention.
- S.20 RTP's external focus and the presence of corporate members in its Board and staff present an opportunity for RTP to support NDSU's President and his senior staff in extending NDSU's day-to-day capacity for sustaining these important communications, connections, and collaborations in the region.

NDSU already has significant connections in Fargo and in the Red River Valley. The President, as noted earlier, is a member of the VPP's Steering Committee for its new *Economic Development Plan*.

In the new Plan that EKA urges, the RTP no longer would be perceived as a separate enterprise; it would be understood to be a major element in the NDSU *Research and Innovation* strategy and system. Thus, while the President always will lead strategy decisions regarding regional collaborations, he might find it helpful to delegate day-to-day coordination—for example, representing NDSU in committees—to RTP leadership.

NDSU Research and Innovation Strategy Phase 1—Assessment and Strategic Directions

Exhibits

12—EXHIBITS

Exhibit 1—Phase 1 Interviewees

RESEARCH AND INNOVATION STRATEGY - PHASE 1 INTERVIEWS		
Last Name	First Name	Title /Organization
NORTH DAKOTA STATE UNIVERSITY		
President, Provost, and Vice Presidents - Individual		
Bollinger	Bruce	Vice President, Finance & Administration
Bresciani	Dean	President
Grafton	Ken	Vice President, Agricultural Affairs
Mayo	Doug	President/CEO, NDSU Research Foundation (actually with VP Group)
Rafert	Bruce	Provost (also Research Park Board and Research Foundation Board Groups)
Wilson	Chris	General Counsel
Vice Presidents - Focus Group		
McDaniel	Laura	Assistant Vice President, University Relations
Myers	Evie	Vice President, Equity, Diversity, and Global Outreach
Wallman	Marc	Interim Vice President for Information Technology
Associate Vice Presidents and Associate Deans - Focus Group + Two Also Individual Interviews		
Anderson	Dennis	Associate Vice President, Business Development & Industrial Relations, Research / Creative Activity
Anderson	Sheri	Associate Vice President, Program Development and Operations, Research & Creative Activity
Buchanan	David	Associate Dean, College of Agriculture, Food Systems, and Natural Resources
Friesner	Daniel	Associate Dean, College of Pharmacy, Nursing, & Allied Sciences
Kettner	Val	Associate Vice President, Sponsored Programs Administration, Research & Creative Activity
Naughton	Cynthia	Senior Associate Dean, College of Pharmacy, Nursing, & Allied Sciences
Sanders	Gregory	Associate Dean, College of Human Development and Education
Schuh	Jane	Assistant Dean for Academic Programs, College of Agriculture, Food Systems & Natural Resources
Deans / Other - Individual (or Small Group of 2 or 3)		
Johnson	Ron	Dean, College of Business
Johnson	Virginia Clark	Dean, College of Human Development & Education
Peterson	Charles	Dean, College of Pharmacy, Nursing & Allied Sciences
Sandstrom	Kent	Dean, College of Arts, Humanities & Social Sciences
Smith	Gary	Dean, College of Engineering and Architecture
Wittrock	David	Dean, Graduate School
Wood	Scott	Dean, College of Math and Science
Office of the Vice President for Research - Focus Group		
Grosz	Teryl	Manager, IRB (Human Research Protection Program)
Hayden	Josie	Research Compliance Administrator, animal care center
Kettner	Val	Assistant Vice President, Sponsored Programs
Larson	Tracy	Administrative Asst., Office of Tech Transfer
Lueke Love	Jocelyn	Industry Contracts
Renner	Carol	Communications Manager
Roehl	Denise	Administrative Secretary, Office of Tech Transfer
Shirley	Kristy	Research Compliance Administrator, Institutional Review Board
Sizer	Kay	Manager of Faculty Development & Special Projects
Slanger	Marie	Budget and Program Officer
Slicer	Laura	Budget and Research Administration
Walden	Scott	Director of Animal Resources & Attending Veterinarian

(more)

RESEARCH AND INNOVATION STRATEGY - PHASE 1 INTERVIEWS		
Last Name	First Name	Title /Organization
NORTH DAKOTA STATE UNIVERSITY (Continued)		
Center and Institute Directors - Focus Group		
Bierwagen	Gordon	Director, Center for Surface Protection
Habedank	Debra	Director, Center for Child Development
Klenow	Daniel	Co-Director, Center for Disaster Studies and Emergency Management
Lande	Mark	Interim Director, Center for Nanoscale Science and Engineering
Ossowski	Martin	Director, Center for Computationally Assisted Science and Technology
Padmanabhan	G.	Director, Water Resources Research Institute
Reinholz	Aaron	Associate Director for Electronics Technology, CNSE
Tolliver	Denver	Director, Upper Great Plains Transportation Institute (UGPTI)
Tweeten	Kathleen	Director, Extension Center for Community Vitality
Wright	Newell	Director, Center for Global Initiatives
Distinguished Faculty - Focus Group + One Individual		
Boudjouk	Phillip	Distinguished Professor of Chemistry (and former VP for Research) - Individual
Gudmestad	Neil	University Distinguished Professor, Plant Pathology
Katti	Kalpana	University Distinguished Professor, Civil & Environmental Engineering
Perrizo	William	University Distinguished Professor, Computer Science
Reynolds	Lawrence	University Distinguished Professor, Animal Science
Sibi	Mukund	University Distinguished Professor, Chemistry & Biochemistry
NSF Career Award Recipients - Focus Group		
Abdelrahman	Magdy	Associate Professor, Civil & Environmental Engineering
Brueggeman	Robert	Assistant Professor, Plant Pathology
Chu	Xuefeng (Michael)	Associate Professor, Civil & Environmental Engineering
Greenlee	Kendra	Assistant Professor, Biological Sciences
Haring	Stuart	Assistant Professor, Chemistry & Biochemistry
Jayaraman	Sivaguru	Associate Professor, Chemistry & Biochemistry
Rasmussen	Seth	Professor, Chemistry & Biochemistry
Sun	Wenfang	Professor, Chemistry & Biochemistry
Innovation (Faculty) Group - Focus Group		
Mara	Andrew	Department of English
Wells	David	Professor, Dept. of Industrial & Manufacturing Engineering
NORTH DAKOTA STATE UNIVERSITY - RELATED CORPORATIONS		
Research Park Board of Directors (and Staff) - Focus Group; Some Individual		
Batcheller	Barry	Research Park Board Member and CEO, Appareo Systems
Cosgriff	John	Incubator Manager
Ellingson	Larry	Research Park Board Member
Hoge	Chuck	Executive Director, NDSU Research & Technology Park
Martin	Barry	Research Park Board Member
Rusch	Kelly	Vice President for Research
Sobolik	Jan	Operations Specialist, NDSU Research & Technology Park (also Individual)
Steffes	Paul	Research Park Board Member and CEO, Steffes Corporation
Research Foundation Board of Directors (not listed elsewhere)		
Birdsall	Mark	Owner, Birdsall Grain & Seed
Zetocha	Dale	Executive Director, NDSU Research Foundation (actually with VP Group)

(more)

RESEARCH AND INNOVATION STRATEGY - PHASE 1 INTERVIEWS

Last Name	First Name	Title /Organization
NORTH DAKOTA HIGHER EDUCATION		
State System / Board of Higher Education and Public Education - Individual		
Dieterich	Kirsten	Chair, ND Board of Higher Education
Morton	Don	ND Board of Higher Education and Site Leader, Microsoft
Skogen	Larry	Chancellor, North Dakota University System
Other ND Institutions / Agencies - Individual		
Baesler	Kirsten	State Superintendent, ND Department of Public Instruction
Davison	Kyle	Executive Director, Southeast Education Cooperative
Gjovig	Bruce	CEO, UND Innovation Center
Richman	John	President, North Dakota State College of Science
NORTH DAKOTA STATE GOVERNMENT AND ECONOMIC DEVELOPMENT		
ND Executive - Office of the Governor - Individual		
Anderson	Al	Commissioner, North Dakota Department of Commerce
Dalrymple	The Hon. Jack	Governor, State of North Dakota
Effertz	Kayla	Senior Policy Advisor, Office of the Governor
ND Economic Development Foundation and Centers of Excellence Commission - Individual		
Goulet	Wally	ND Economic Development Foundation, Chairman
Shalhoob	Bill	ND Economic Development Foundation
Nisbet	Mark	ND Economic Development Foundation; Centers of Excellence Commission; North Dakota Principal Manager, Xcell Energy
Traynor	Jim	ND Economic Development Foundation; Business Development, Intelligence InSites
REGIONAL ENTITIES AND FARGO-MOREHEAD (including Business Leaders)		
City of Fargo / Fargo-Morehead - Individual		
Gartin	James	President, Greater Fargo-Morehead Economic Development Corporation
Walaker	The Hon. Dennis	Mayor of Fargo
Walters	Brian	CFO, Aldevron; former Director, Greater Fargo-Morehead Economic Development Corporation
Whitney	Craig	CEO, Fargo Chamber of Commerce
Wimmer	Brad	Councilman, City of Fargo
Region: Grand Forks and Valley Prosperity Partnership - Individual		
Shorma	Thomas	CEO / President WCCO Belting; Valley Prosperity Partnership
Theissen	Klaus	President & CEO, Grand Forks Region Economic Development Corp
BUSINESS / INDUSTRY (RESEARCH PARK, OTHER BUSINESS LEADERS)		
Incubator Tenants - Focus Group		
Kraft	Troy	VP Global Compact Engineering, Bobcat (Doosan)
Nyren-Erickson,	Erin	CEO, HQC BioSciences
Slator	Brian	President, WOWIWE Instruction Co.; Professor NDSU Dept. of Computer Science and Operations Research
Ulven	Chad	Chief Technology Officer, c2renew; Assoc. Prof. NDSU Dept. of Mechanical Engineering
Other Research Park / Other Business Leaders - Individual		
Grindberg	Tony	Aviation Business Unit Manager, Appareo Systems, and former CEO of the Research Park
Warner	Alex	CEO, Pedigree Technologies (Incubator Graduate)
Budan	Tom	General Manager, John Deere Electronic Solutions (Research Park Occupant)
Chambers	Michael	President and CEO, Aldevron
Danielson	Miguel	Emerging Prairie Group
Joraanstad	Jake	Emerging Prairie Group; CEO, Myriad Mobile
Pearce	David	Vice President of Research, Sanford Health
Wyland	Brenda	Director of Marketing, Appareo Systems; former Interim Director of NDSU Research Park; former Associate Director and Incubator director
Industry Associations - Individual		
Christianson	Kim	North Dakota Alliance for Renewable Energy
Lilja	Tom	Executive Director, ND Corn Growers Assoc.
Ness	Ron	President, North Dakota Petroleum Council
Source: Eva Klein & Associates		

Exhibit 2—Innovation Symposium Material

*The Relevant University:
Emerging Innovation and Engagement Strategies
of 21st Century Institutions*

Presentation for
North Dakota State University
and
NDSU Research Park

December 13, 2013



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Presentation Outline

- **The Global Knowledge Economy**
 - Observations on Contexts and Definitions
- **Universities and Innovation Eco-Systems**
 1. Human Capital
 2. Research and Innovation
 3. Regional Stewardship for Quality of Place
- **The 21st Century *Relevant University*—Two More Challenges**
 1. More Sustainable Business Models
 2. Faculty Roles, Rewards, and Culture
- **Creating the Future**
 - Toward a Possible Definition
 - For NDSU Discussion



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In 8,000 Years of Human Economies and Societies:
 Only 3 HUGE Transformations



Pre-Agrarian
 – Pre-history to 8,000 BC

- Hunting/Gathering
- Nomadic Cultures
- Emergence of Tools



Agrarian
 – Since @ 8,000 BC

- Agricultural Cultivation
- Formation of Communities
- Laws for Land Ownership



Industrial
 – Since @ 1800

- Machines/Production Process
- Literacy/Public Schools
- Business Organizations & Law



Knowledge
 – Since last few decades

- Innovation & Technology
- Knowledge Work Force
- Globalization, Alliances, Regionalism, Networks

**So, What is Different in the Global Knowledge Economy?
Answer = Everything**

- Time
 - Rapid velocity of change
- Communications
 - Instant, constant, and networked
- Economic Performance
 - Regionalization; global competitiveness
- Markets/Trade
 - Transnational
- Business Firms
 - Agility
- Work Force
 - High-skilled and highly-mobile
- Industry Clusters
 - Visible scale & critical mass
- Economic Strategy
 - Larger regional scale
 - Outside the US, driven by national policies



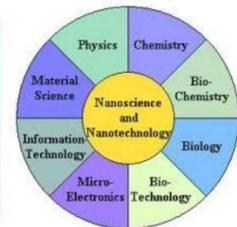
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**What is Different?
4 Mega-Industry Clusters**

- Information and Telecommunications
 - Hardware
 - Software
 - Telecommunications and Internet services
 - Security and cyber-security
- Life Sciences
 - Genomics-human, plant, animal
 - Diagnostics, treatments, biomaterials, bioengineering
 - Food supply
- Advanced & Sustainable Manufacturing
 - New Materials, e.g. nanomaterials
 - New Processes, e.g., nanomanufacturing
 - Customization; identification; compatibility
- Energy and Environment
 - Alternative/clean energy
 - Transportation and logistics
 - Protection/remediation/security—water, air, earth
 - Sustainability

We cannot build widespread prosperity based on Services/ Financial Sector!

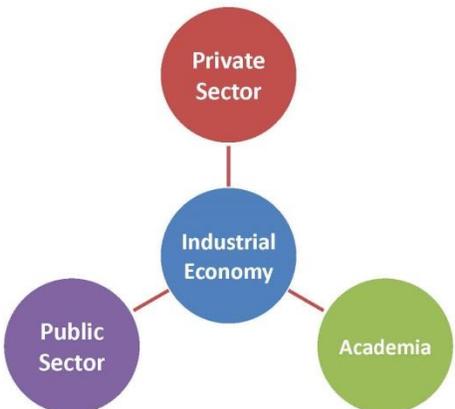


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The Biggest Difference: From Sectoral to Functional Organization

In the Industrial Economy
 Functions were organized **within sectors**



Wealth = Capital + Labor

In the Knowledge Economy
 Functions are organized **across sectors**



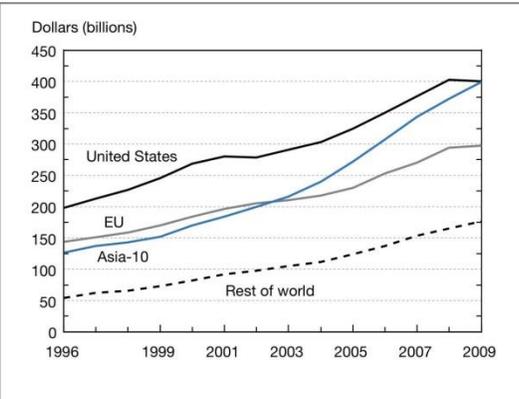
Wealth = Capital + Human Capital

Today, very little can be accomplished without viable partnerships.

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The Other Biggest Difference: Flat World Competitiveness

R&D expenditures for US, EU, and 10 Asian economies: 1996–2009



Source: National Science Board, Science and Engineering Indicators, 2012, <http://www.nsf.gov/statistics/seind12/slides.htm#g1>

In benchmarking, we can no longer only consider other US states/regions.

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Asia's Dynamic Global Cities



Source: Prof. SHIH Choon Fong, Singapore University

China

- World's second-largest R&D performer
- 12% of total global R&D
- 20% annual growth

<http://www.scidev.net/global/capacity-building/news/asian-countries-collectively-top-us-r-d-spend.html>

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**What is a Regional Knowledge Economy?
A Definition**

- Captures and commercializes innovation
- Advances competitiveness of traditional industries
- Grows visible, globally-competitive clusters in new knowledge-intensive enterprises
- Creates and sustains supply of human capital—innovators and a highly-skilled knowledge work force



This is the fundamental explanation for why universities and colleges now are central to economic development...while they were not in the Industrial Economy.

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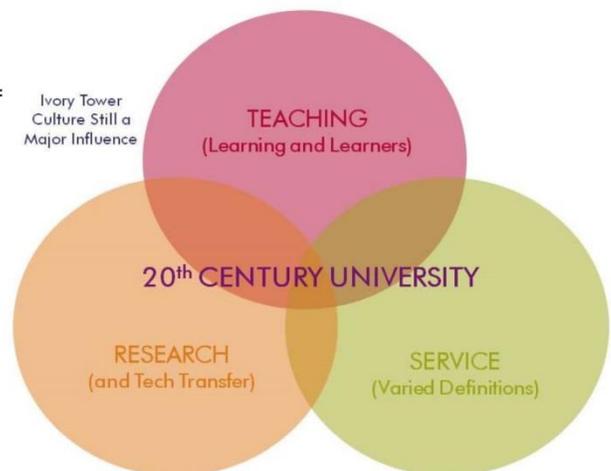
**Mission of the 20th Century University
in the Late Industrial Economy**

Teaching = 18 to 26 year olds

In **Research**, main metric is publication. Commercialization = a recent mission expansion

Service = has been ill-defined and not measured or valued in the reward system

Metrics = most/all were “internal”



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Mission of the 21st Century Relevant University in the Global Knowledge Economy

Human Capital = Take responsibility for all of it—cradle to grave

Leader and partner for **Innovation Eco-Systems and Engaged Scholarship**

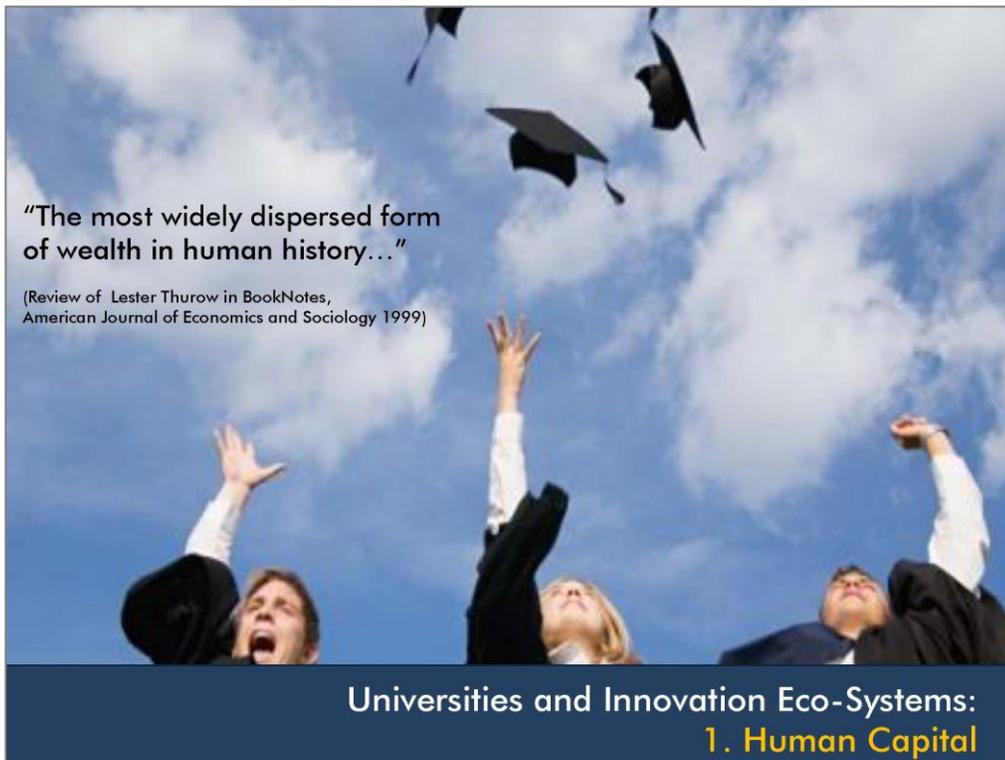
Define and reward **Regional Stewardship for Quality of Place**

Metrics = Must add external metrics (impact for constituents)



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**Intellectual Capital :
Business Definitions**

- Human Capital =
 - The knowledge residing in the heads of employees that is relevant to the purpose of the organization

- Customer Capital =
 - The value of a company’s ongoing relationships with the people or organizations to which it sells
 - e.g., market share, customer retention and defection rates, and profit per customer

- Structural Capital =
 - The knowledge retained within the organization
 - Belongs to the company as a whole and can be reproduced and shared. Structural capital includes technologies, inventions, publications, and business processes
 - “Knowledge that doesn’t go home at night”

Source: Stewart, Thomas. *Intellectual Capital*. 1998. Quoted at http://www.ultimatebusinessresource.com/images/intellectual_capital.pdf



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**If Human Capital Matters, Then Population Matters:
10 US Megapolitans**



Source: Lang and Dhavale, Metropolitan Institute at Virginia Tech University, 2005



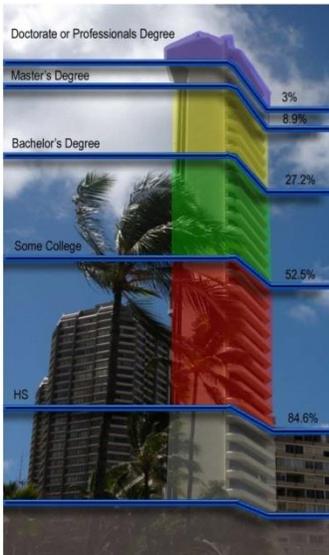
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**But Population is Only a Competitive Advantage
 When Educational Attainment is Competitive**

Dangerously Lagging US Competitiveness

- Sixth in global innovation-based competitiveness, but 40th in rate of change over the last decade
- 11th among industrialized nations in the fraction of 25- to 34-year-olds who have graduated from high school
- 16th in college completion rate
- 22nd in broadband Internet access
- 24th in life expectancy at birth
- 27th among developed nations in the proportion of college students receiving degrees in science or engineering
- 48th in quality of K-12 math and science education
- 29th in number of mobile phones per 100 people.

<http://www.nap.edu/catalog/12999.html>, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*. By Members of the 2005 "Rising Above the Gathering Storm" Committee; Prepared for the Presidents of the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. As summarized/quoted by Thomas L. Friedman, Op Ed, *The New York Times*, October 26, 2010.



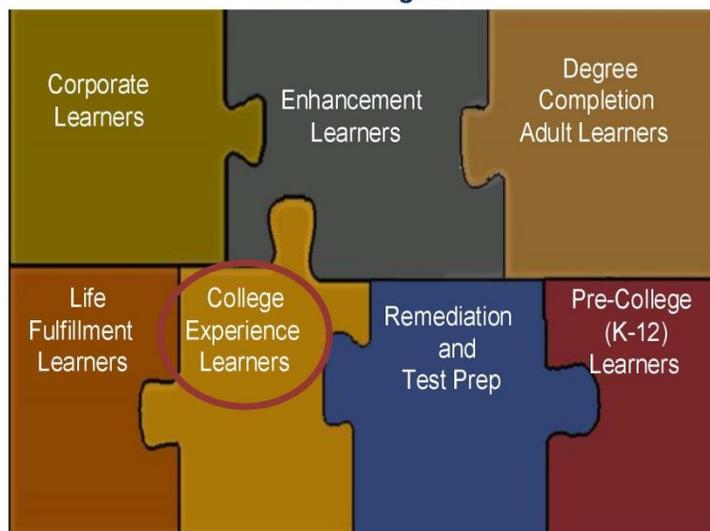
It is about:
 Educational Attainment
 and
 Innovation Capacity
 of the
 Population
 In this, higher
 education
 MUST lead.



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**To Sustain Human Capital for Success in the Global Knowledge Economy:
 Maybe Everyone Will Always Be "in College"**

7 Learner Segments



Source: Linda L. Baer, Minnesota State Colleges and Universities



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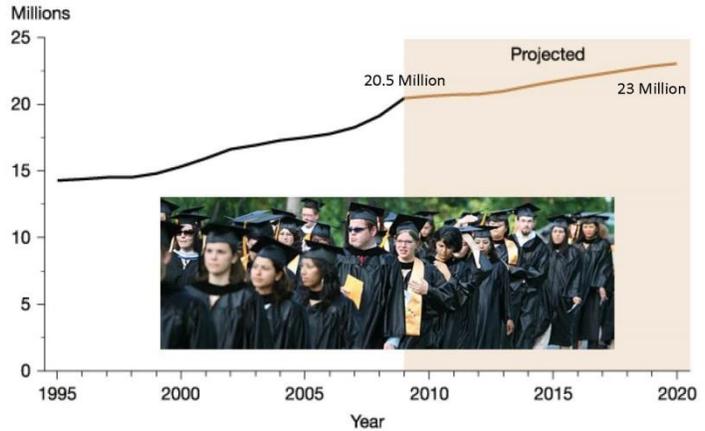
**So, What if NCES Projections are Wrong?
What if Lumina and Others Get their Way?**

2025 Goal = 60%
with quality college
degree or credential
vs. ± 28% now



University of Phoenix
recently claimed that 38
million US adults are
seeking college degrees.

Figure 16. Actual and projected numbers for total enrollment in all postsecondary degree-granting institutions: Fall 1995 through fall 2020



http://nces.ed.gov/programs/projections/projections2020/figures/figure_16.asp?referrer=list



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**And, Not Only a Numbers Game:
The Biggest Questions are Qualitative**

- What is our “product” and how do we measure it?
 - What does the credentialed graduate know and know how to do?
 - What education experiences yield the most adaptable life-long learners?
 - What are the uses and limitations of standardized testing?
 - Can the liberal arts / general education requirements still save us?

- Or, how do we produce very large numbers of people who:
 - Have baseline knowledge about many things
 - Have some specialized knowledge in some one thing
 - Think critically and creatively; think of themselves as innovators
 - Remain high-functioning throughout their lives
 - Find it easy to return to education when needed

Above Questions =
Eva’s ideas for the agenda of
every Faculty Senate meeting!



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Technology and Pedagogy: Now Rapidly-Evolving Changes



2,000 Years Ago



1,000 Years Ago



600 Years Ago



150 Years Ago





Yesterday

And then what...in 2030?

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Knowledge and Learning: Going Mobile and Ubiquitous



We do not have a grip on this yet.

We still must figure out how to use technology properly in the learning process.



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And, Being in the Human Capital Business Means We're Also in the Social/Civic Capital Business

Private/Individual	Public/State
<ul style="list-style-type: none"> • Higher salaries and benefits • Higher savings levels • Improved working conditions • Self-sufficiency • Greater productivity • Improved health/life expectancy 	<ul style="list-style-type: none"> • Increased tax revenues • Greater workforce productivity • Increased consumption • Increased workforce flexibility • Decreased reliance on government financial support • Lower health care costs

Education Attainment = Up

GDP = Up
Civic Engagement = Up
Tax Revenues = Up

Welfare Needs = Down
Cancer Rate = Down
Incarceration Rate = Down

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Universities and Innovation Eco-Systems:
2. Research and Innovation

**R&D Performance by Sectors:
 Putting University Research in Perspective**

Table 4-13
Gross expenditures on R&D by performing sector, for selected countries: Most recent year
 (Percent)

Country	Business	Government	Higher education	Private nonprofit
United States (2007)	71.9	10.7	13.3	4.2
Japan (2007)	77.9	7.8	12.6	1.7
China (2007)	72.3	19.2	8.5	0.0
Germany (2007)	69.9	13.9	16.2	0.0
France (2007)	63.2	16.5	19.2	1.1
South Korea (2007)	76.2	11.7	10.7	1.4
United Kingdom (2007)	64.1	9.2	24.5	2.1
Russian Federation (2007)	64.2	29.1	6.3	0.3
Canada (2008)	56.1	9.6	33.8	0.5
Italy (2006)	48.8	17.2	30.3	3.7

NOTE: Top 10 R&D performing countries.

SOURCE: Organisation for Economic Co-operation and Development, Main Science and Technology Indicators (2009/1).

Science and Engineering Indicators 2010



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Huge Importance of Research—Especially STEM²

- MORE of everything:
- ...Funding
- ...Complex partnerships
- ...Problem focus
- ...Applied outcomes
- ...Actual impact



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Research in an Innovation System: Starting from Both Ends

Fundamental Applied Development

Fundamental Applied Development

Fundamental Applied Development

Need new models

Corporate R&D investments are shifting to Development.

Corporate R&D decreasing.? Greater emphasis on what universities do.

We still need robust Fundamental Research funding and high performance in our universities.

Source: ROBERT D. ATKINSON AND LUKE A. STEWART, MAY 2011

College of Textiles NC State

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First Problem: What is "Innovation?"

"Learning and innovation go hand in hand."
(emphasis added).

"The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow."

William Pollard

<http://apm.stanford.edu/group/courses/project-innovation-through-design-thinking.php>

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First Problem:
“What is “Innovation?”

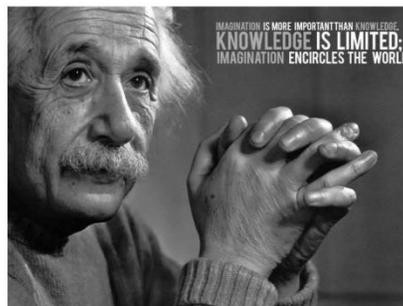
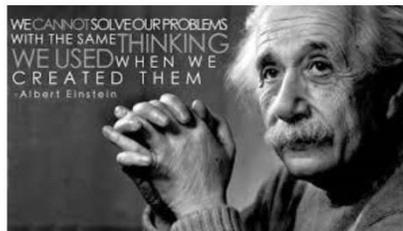
Business-centric definitions, such as:

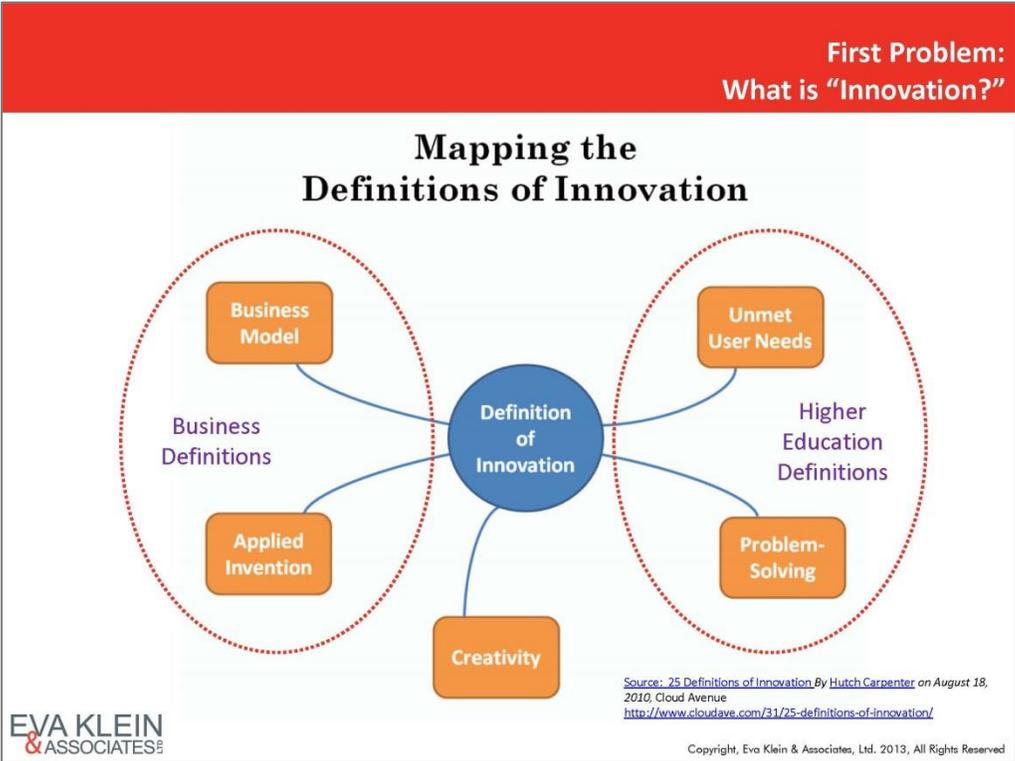
- *Innovation is the specific instrument of entrepreneurship...the act that endows resources with a new capacity to create wealth.*
Peter Drucker (1909-2005), *Innovation and Entrepreneurship*, 1985)
- *Business has only two basic functions—marketing and innovation.*
Peter Drucker or Milan Kundera (Czech novelist)
- *Innovation has nothing to do with how many R&D dollars you have. When Apple came up with the Mac, IBM was spending at least 100 times more on R&D. It's not about money. It's about the people you have, how you're led, and how much you get it.*
Steve Jobs (1955-2011), *Fortune*, November 9, 1998
- *Innovation is the central issue in economic prosperity.*
Michael Porter



First Problem:
“What is “Innovation?”

- What did Albert Einstein think about Innovation?
 - *We cannot solve our problems with the same thinking we used when we created them.*
 - *The true sign of intelligence is not knowledge but imagination.*
 - *Anyone who has never made a mistake has never tried anything new.*





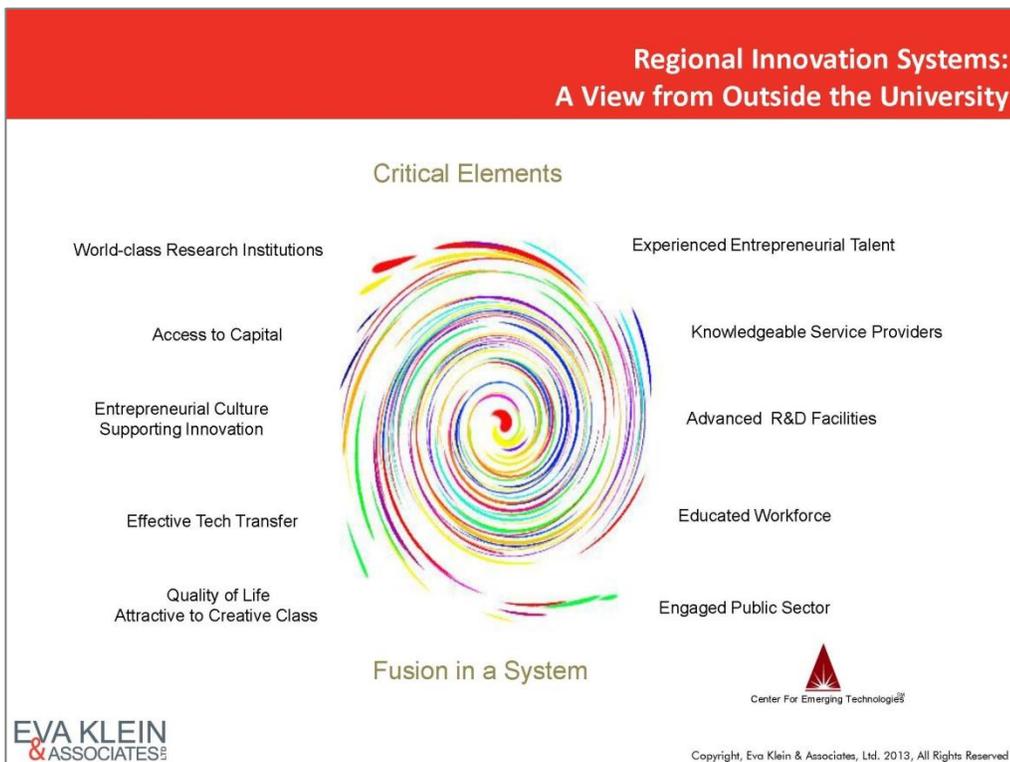
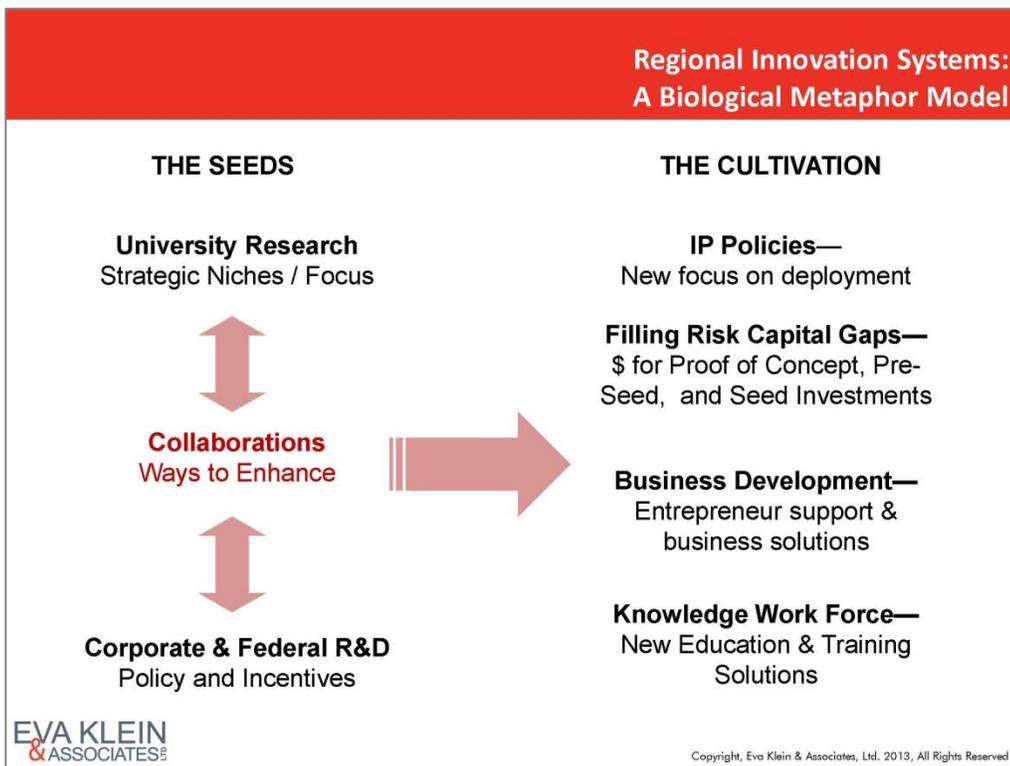
Regional Innovation Systems Metaphors for Higher Education’s Roles

- **Machine Metaphors:**
 - Suggestion that this is where the pace is set for the region’s progress
 - *Engine, powerhouse, driver, dynamo, booster, accelerator, or lever*
- **Biological Metaphors:**
 - Suggests associations with something that sprouts, then blossoms or reinvigorates
 - *Hothouse, seedbed, breeding ground, spawning place, catalyst, or fermenter*
- **Network Metaphors:**
 - Suggests access to and dissemination of information and knowledge
 - *Node, hub, bridgehead, mediator, coupling unit, transfer point, transmission centre*
- **Time Metaphors:**
 - Suggests higher education takes lead in a transformation process
 - *Spearhead, vanguard, lighthouse, and signpost*

Peter Arbo, Peter and Benneworth, Paul. *Understanding the regional contribution of higher education institutions: A literature review, Introduction, pp. 6-7, OECD, 2006*

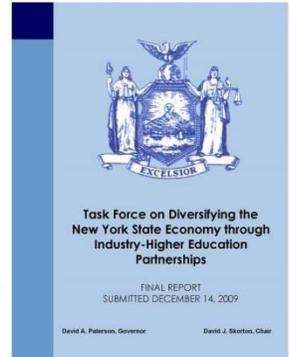
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**Regional Innovation Systems
The Skorton Report—NY State, 2009**

- **Research universities**
 - Boasting world-class expertise in a given area or areas
- **R&D-dependent industry**
 - That seeks to leverage open-innovation principles
- **Access to capital**
 - Characterized by both available investment capital and high levels of communication between venture capitalists and university researchers
- **Business services**
 - For researchers and entrepreneurs looking to commercialize their research
- **Critical mass**
 - Of researchers, entrepreneurs and investors with knowledge of strategic research areas (with “strategic” defined by industry and academic expertise and investment in those areas)
- **Clearly defined government policies**
 - That establish broad-based technology priorities in areas of existing strength with growth potential and invest in those priorities
- **Communication networks**
 - That facilitate collaboration between institutions of higher education, industry and the professional investment community
- **Regular, public reporting of metrics**
 - Measuring nationwide, state-, university- and company-level performance on innovation capacity, activity and outcomes



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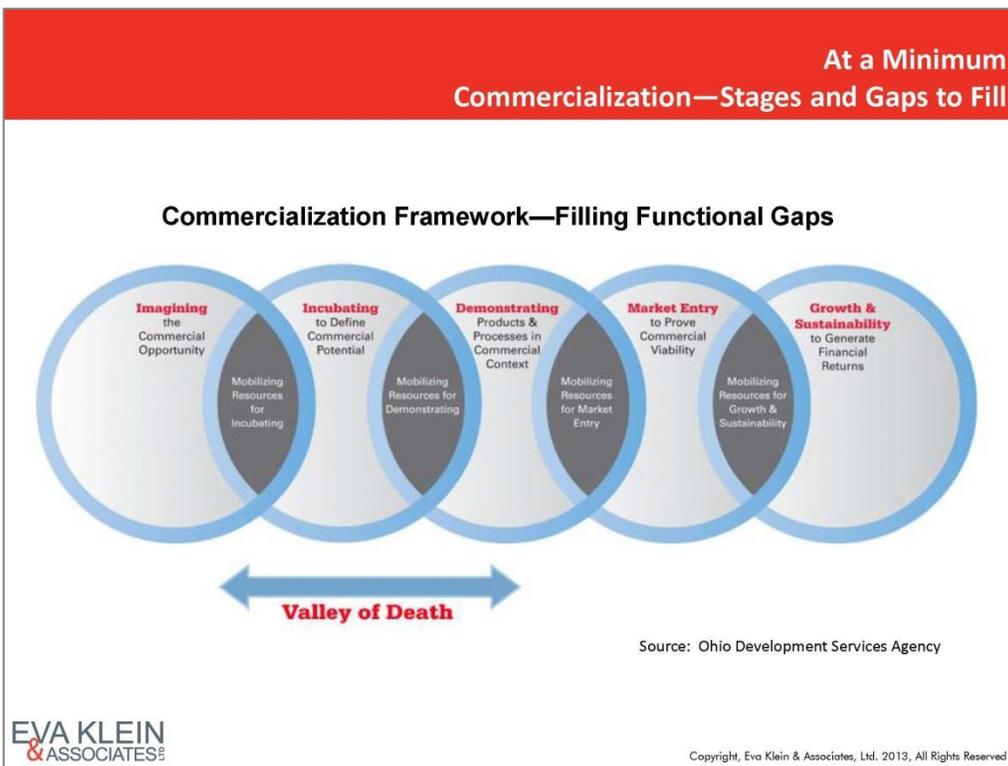
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**Regional Innovation Systems
Ohio Board of Regents**



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**Do we Overstate the Case for Intellectual Property Protection?
Universities are NOT Top Patent Producers!**

Rank	Organization	2012 Patents
1	International Business Machines Corp.	6,457
2	Samsung Electronics Co., Ltd.	5,043
3	Sony Corp.	3,608
4	Canon K.K.	3,307
5	Panasonic Corp.	2,829
6	Hitachi, Ltd.	2,723
7	Microsoft Corp.	2,704
8	L.G Electronics Inc.	2,682
9	Toshiba Corp.	2,601
10	General Electric Co.	2,040
11	Siemens Corp.	2,000
12	Fujitsu Ltd.	1,923
13	Toyota Jidosha K.K.	1,491
14	Qualcomm, Inc.	1,471
15	Seiko Epson Corp.	1,454
16	Hewlett-Packard Co.	1,445
17	Ricoh Co., Ltd.	1,407
18	AT&T Corp.	1,406
19	General Motors Corp.	1,374
20	Intel Corp.	1,287
21	Xerox Corp.	1,213
22	Broadcom Corp.	1,157
23	Google, Inc.	1,151
24	Apple, Inc.	1,136
25	Sharp Corp.	1,097

14 Universities Among Top 300 Organizations Granted US Patents in 2010

Rank	IP Owner	# Patents
1	International Business Machines, Inc.	5,866
83	University of California (Regents of)	349
152	Massachusetts Institute of Technology	174
163	Stanford University	155
184	Wisconsin Alumni Research Foundation	136
188	California Institute of Technology	134
199	University of Texas	122
228	Tsinghua University	104
262	University of Illinois	85
269	University of South Florida	83
272	Columbia University	82
286	University of Michigan	78
289	University of Pennsylvania	77
298	Cornell Research Foundation, Inc.	74
301	University of Washington	74

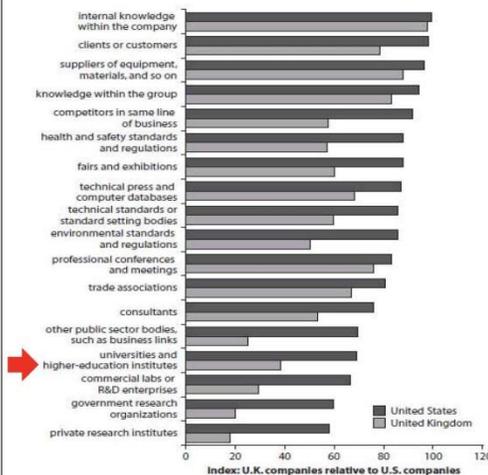
Source: Intellectual Property Owners Association, www.ipo.org, May 25, 2011



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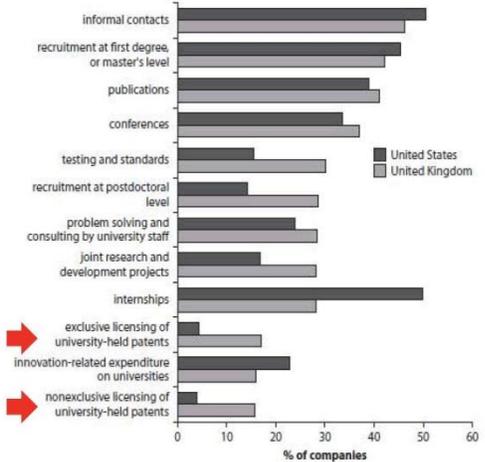
**Do we Overstate the Case for Intellectual Property Protection?
IP is Not High on List of What Companies Want from Universities**

Where Companies Source their Innovation



Source: Cosh, Hughes, and Lester 2006.

Figure 4.1. University-Industry Interaction Contributing to Innovation



Source: Cosh, Hughes, and Lester 2006.

John Steen, University of Queensland Business School, *Do Universities Matter for Innovation?* June 12, 2011 at <http://www.innovationexcellence.com/blog/2011/06/12/do-universities-matter-for-innovation/>



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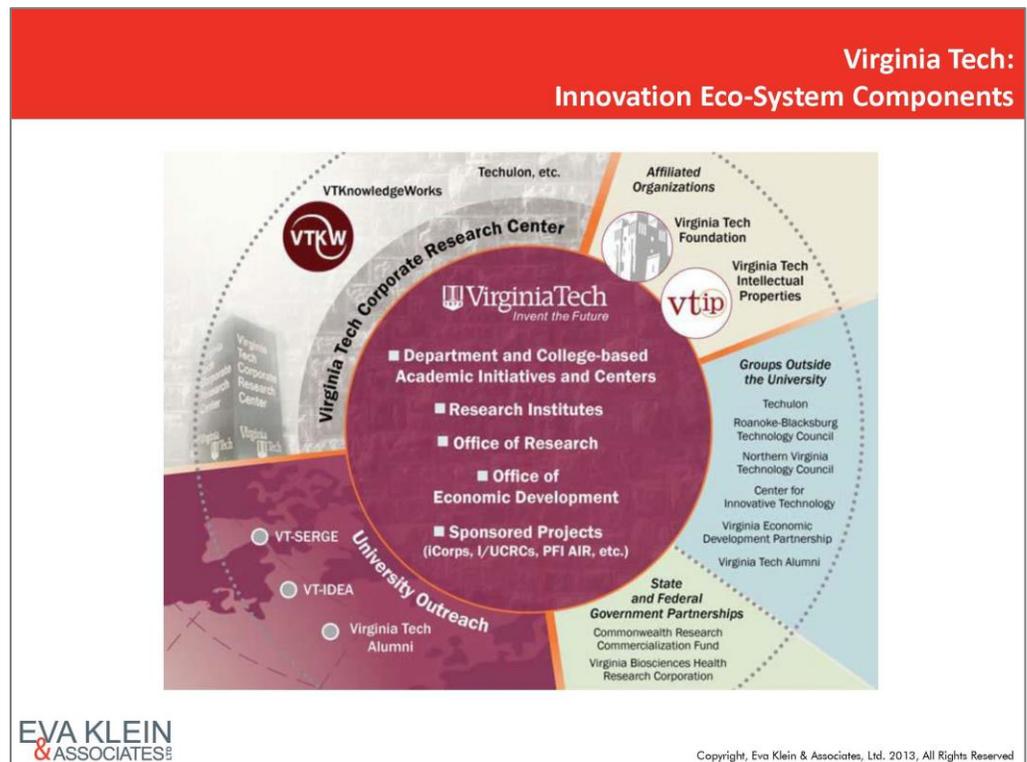
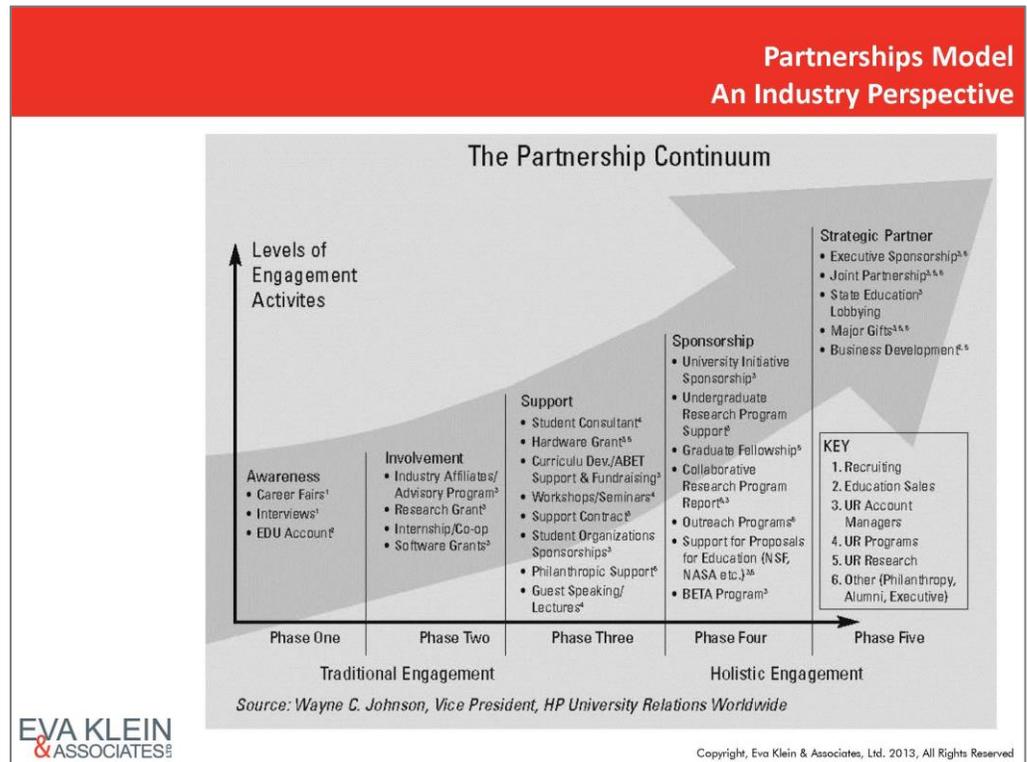
University Roles in an Innovation System: What Companies Really Want

- ◆ Educating people
 - Training skilled undergraduates, graduates & post-docs
- ◆ Providing public space
 - Forming/accessing networks and stimulating social interaction
 - Influencing the direction of search processes among users and suppliers of technology and fundamental researchers
 - Meetings and conferences
 - Hosting standard-setting forums
 - Entrepreneurship centers
 - Alumni networks
 - Personnel exchanges (internships, faculty exchanges, etc.)
 - Joint academic-industry visiting committees
 - Curriculum development committees
- ◆ Increasing the stock of ‘codified’ useful knowledge
 - Publications
 - Patents
 - Prototypes
- ◆ Problem-solving
 - Contract research
 - Cooperative research with industry
 - Technology licensing
 - Faculty consulting
 - Providing access to specialised instrumentation and equipment
 - Incubation services

Andy Cosh, Alan Hughes, and Richard K. Lester, UK plc: Just How Innovative Are We? Findings from the Cambridge-MIT Institute International Innovation Benchmarking Project, Industrial performance Center, Massachusetts Institute of Technology, Working Paper Series, December 2006, page 8. <http://web.mit.edu/ipc/publications/pdf/06-009.pdf>

University-Industry Demonstration Partnerships Guiding Principles

- **Guiding Principle # 1: Institutional Missions Define the Scope of Potential Collaborations**
 - A successful university-industry collaboration should support the mission of each partner. Any effort in conflict with the mission of either partner will ultimately fail.
- **Guiding Principle # 2: A Long-Term Relationship is the Desired End State**
 - Institutional practices and national resources should focus on fostering appropriate long-term partnerships between universities and industry.
- **Guiding Principle # 3: Establish a Framework that Encourages Long-Term University/Industry Collaborations**
 - Universities and industry should focus on maximizing value resulting from collaborations by streamlining negotiations and measuring results.



NC State University: Innovation Eco-System Components

Talent (Award-Winning Faculty) **Place (Centennial Campus Community)** **Tech Transfer Services** **Proof of Concept Fund (Chancellor's Innovation Fund)**

Many Multidisciplinary Research Centers and Institutes (now 75) **Partnership Development Model**

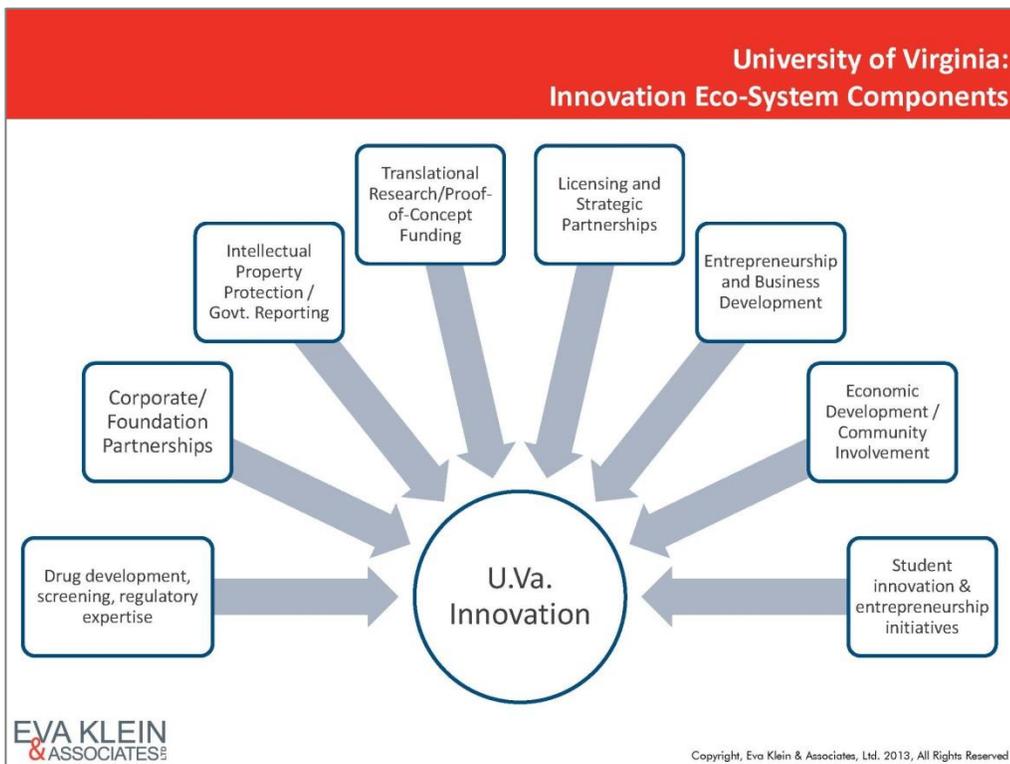
Research News Feed **Innovation-Focused Events** **Resources for Innovators**

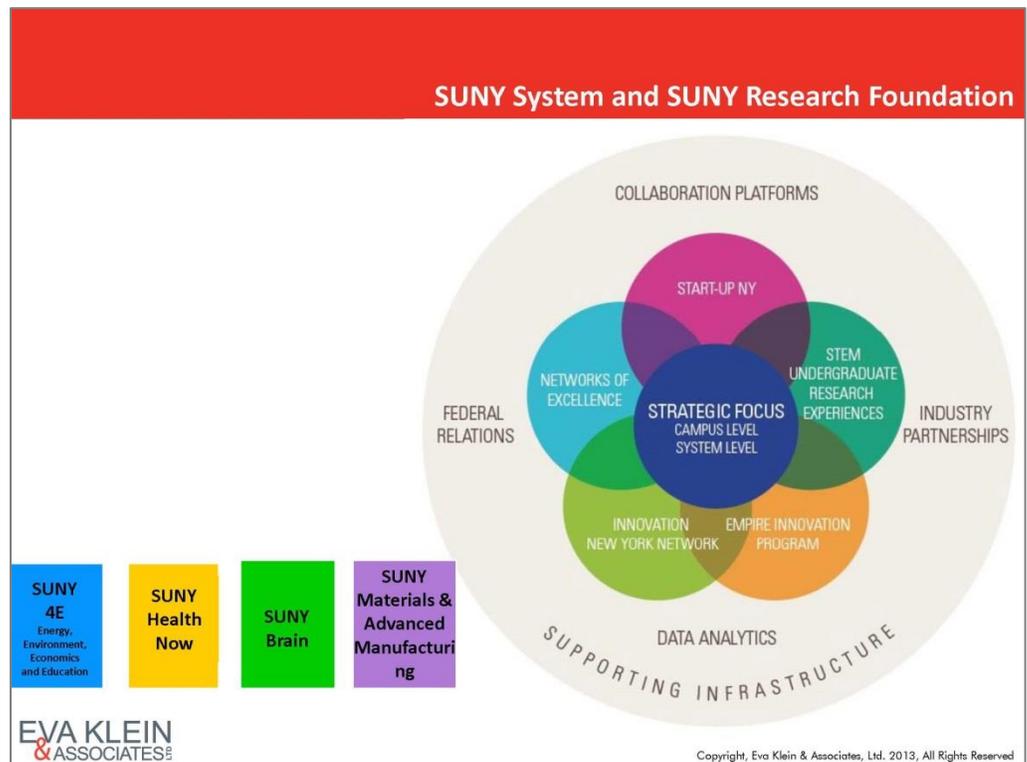
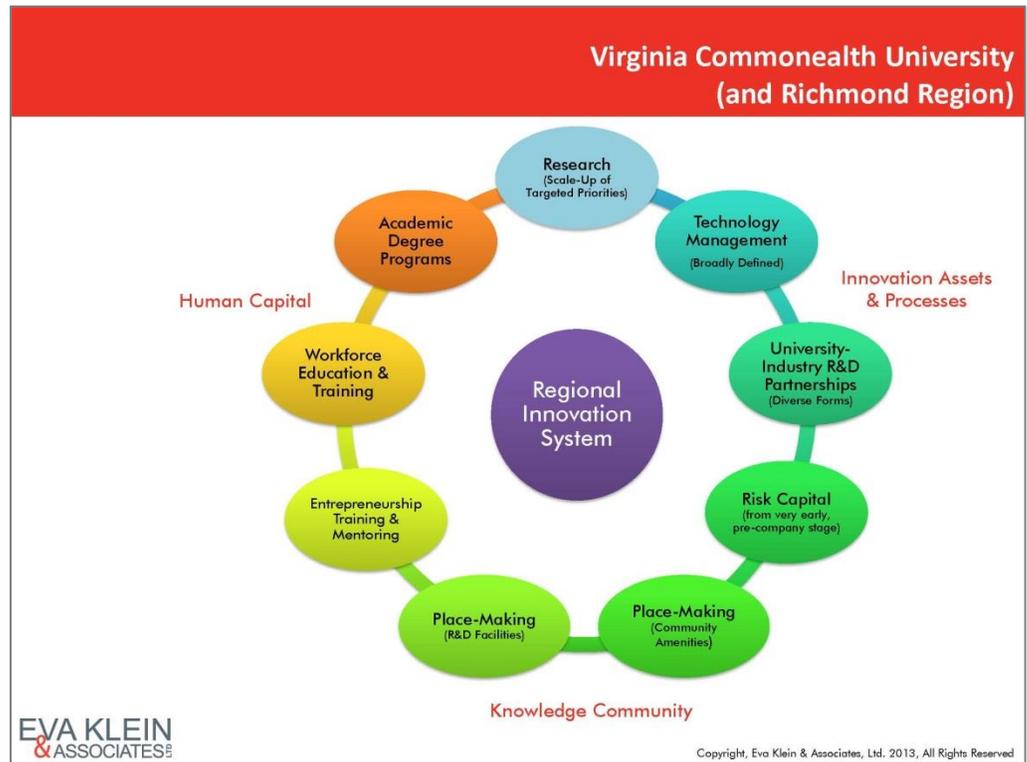
REACH NC
 research, engagement, and capabilities hub of north carolina

REACH NC is a Web portal that enables users to search, browse and find thousands of experts and assets within North Carolina higher education and research institutions. REACH NC's expert profiles can assist people in industry, community groups and university personnel in efforts to find information and potential collaborators for research and problem-solving.

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Universities and Innovation Eco-Systems:
3. Regional Stewardship for Quality of Place

Economic Development Used to Be About “Sites:”
 Now, It’s About “Places”



Cost-Effective Industrial Sites → Cool Places

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Defining Quality of Place
Soul of the Community—Knight Foundation/Gallup Study

- 3 main qualities attach people to place:
 - Openness (how welcoming a place is)
 - The area’s aesthetics (physical beauty; green spaces)
 - Social offerings, such as entertainment venues and places to meet
- Other “drivers:”
 - Education (good schools)
 - Good and affordable health care
 - Safety
 - Basic services
 - Economy
 - Civic involvement
- Drivers of “resident attachment” show little difference across communities
- Communities with these drivers have higher GDP / economic growth

The key factor today revolves around the ability of places to attract talent and unleash it in a broad cross-section of the population.

An energized city is the place where creative, entrepreneurial and forward-thinking people from every walk of life, every class, every lifestyle want to be.

Richard Florida


 Soul of the Community English.m4v

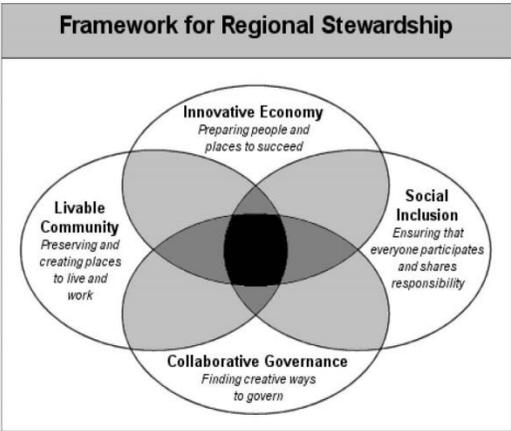
Source: Knight *Soul of the Community* project, 2008-2010, Gallup and Knight Foundation

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A Regional Stewardship Model

Framework for Regional Stewardship



Source: Alliance for Regional Stewardship, in *Tools and Insights for Universities Called to Regional Stewardship*, 2006, Alliance for Regional Stewardship, AASCU and NCHEMS

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Stewardship of Place: Public Education

- Dismal statistics
 - 68% of eighth-graders cannot read at grade level.
 - About 1/3 of US students drop out of high school (50% in some areas)
 - Another 1/3 are not college-ready when they graduate.
- Of 30 developed nations, US is:
 - 24th in Math
 - 17th in Science
 - 10th in Literacy
- Social cost
 - Achievement gap costs the US \$525 billion each year.



This is NOT just about what the colleges of education do.

NBC News "Education Nation,"
<http://www.educationnation.com>

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Stewardship of Place: Health and Wellness

- Many institutions have nursing, allied health, and human/social services programs
- Many institutions can address business, economic, and policy aspects of health care—and promote improvements in their regions
- All institutions can promote health/wellness education in their communities



This is NOT just about what the Health Sciences Centers do.

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Stewardship of Place: Sustainability

This is NOT just about what Engineering and Architecture colleges do.

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Stewardship of Place: Community Development

- Residential communities
- Local business formation and support
- Promoting investment
- Urban/community planning and redevelopment
- Active help to economic development agencies
- Public Pre-K to 12 education
- Youth and family services
- Music, art, cultural assets
- Range and quality of amenities
- Local governance

This includes stewardship activities of every part of the institution.

UNIVERSITY CIRCLE

A Mature Example:
UCI is the development, service, and advocacy organization responsible for the growth of University Circle as a premier urban district and world-class center of innovation in health care, education, and arts & culture.

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The Relevant University:

MAKING COMMUNITY AND ECONOMIC ENGAGEMENT MATTER

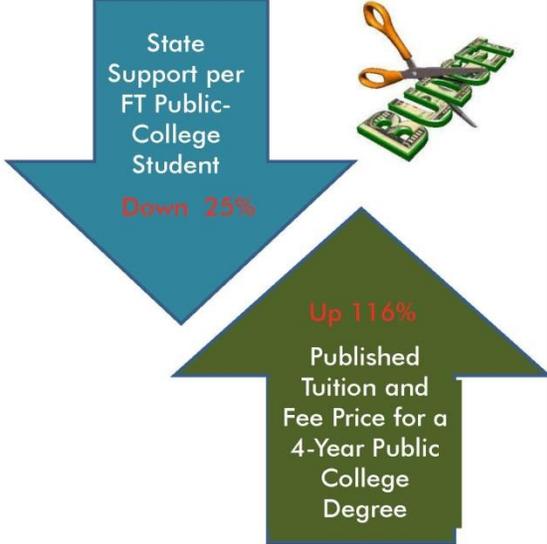
**The 21st Century Relevant University—Two More Challenges:
 1. More Sustainable Business Models**

Nationally, Bleak Long-Term Prospects for State Funding

Despite steadily growing student demand for higher education since the mid-1970s, state fiscal investment in higher education has been in retreat in the states since about 1980. **In fact, it is headed for zero.**

Based on the trends since 1980, average state fiscal support for higher education **will reach zero by 2059...**

State Funding: A Race to the Bottom, Thomas G. Mortensen, American Council on Education, Winter 2012, p. 27



State Support per FT Public-College Student

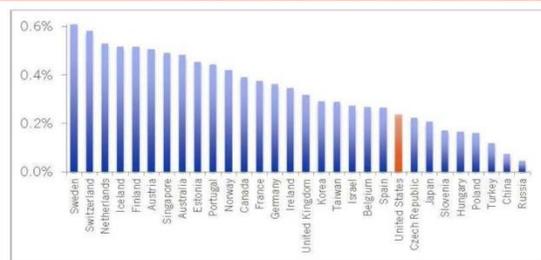
Down 25%

Up 116%
 Published Tuition and Fee Price for a 4-Year Public College Degree

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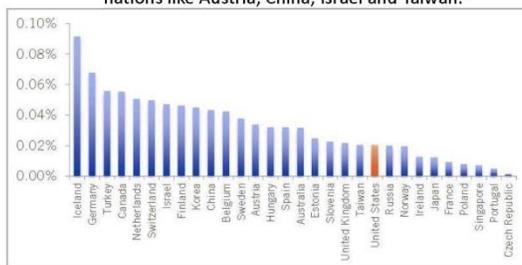
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The US is Well Behind Other Nations in University Research Funding



...in 2008 the United States ranked 22nd out of 30 countries in government-funded university research and 21st in business-funded university research. Moreover, we are falling even farther behind. From 2000 to 2008, the United States ranked 18th in the growth of government-funded university research, with countries like China, Korea and the United Kingdom significantly outperforming the United States. Worse still, the United States ranked 23rd in the growth of business-funded research, with it actually declining as a share of GDP. In contrast, collaboration between universities and business grew dramatically in nations like Austria, China, Israel and Taiwan.²

Figure 2: Government-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2008*



Robert D. Atkinson and Luke A. Stewart. *University Research Funding: The United States is Behind and Falling*. The Information Technology & Innovation Foundation, May 2011, pp. 5 and 6

Figure 3: Business-Funded Research Performed in the Higher Education Sector as a Share of GDP: 2008*

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The Resource Crisis in Federal Funding

*“Cutting the deficit by gutting our investments in **innovation and education** is like lightening an overloaded airplane by removing its engine.*



It may make you feel like you're flying high at first, but it won't take long before you feel the impact.”

President Barack Obama

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The Biggest Ever Challenges for Getting and Using Resources

- HUGE growth demands—a potential avalanche
- Ongoing quality demands (and the problem of defining “quality”)
- Many unknowns about delivery models and institutional forms
- Immense complexity in serving new constituencies
- Increasing costs of “big science”
- We MUST start planning and using facilities differently.



The Two Big Cost Functions of Higher Education) =
Academic Personnel + Campus Facilities

Tighten the Belt, Be More Productive, AND Think Big!!

- **HUGE pressure to BOTH argue for more money and to make better decisions on spending**
 - This is NOT a time for incrementalism in strategic planning and resource management. No “peanut butter budgeting!”
 - We must tighten the belt where we should and then sell a big, clear, compelling vision for growth
- **THE MOST SUCCESSFUL UNIVERSITIES MAY BE THOSE WITH BIG STRATEGIC PLANS AND BIG NEW INVESTMENTS**
 - Texas A&M added 440 faculty in the 1980s/1990s
 - Now has another \$100MM fund for strategic faculty hires
 - Texas A&M and University of Texas benefit from foresight of the Permanent University Fund (PUF)
 - SUNY—Governor is pouring in new money, but requiring enhanced efficiency and measurable productivity improvements
 - University of Virginia—New strategic plan with \$564 MM price tag



The Relevant University:

MAKING COMMUNITY AND ECONOMIC ENGAGEMENT MATTER

The 21st Century Relevant University—Two More Challenges
2. Faculty Roles, Rewards, and Culture

Remember:
The University is a Nearly 1,000 Year Old Institution

- Professionalization of medieval society required:
 - Law
 - Medicine
 - Sciences
- The Ivory Tower
 - Persecution vs. free inquiry
 - Scholarship culture
- We have the Paris model with only a few innovations in nearly 1,000 years
 - New disciplines
 - Land-grant college and extension
 - Community college
- The institution needs innovation and a partial reinvention now

In the late 19th Century, it was a struggle to get Harvard College’s faculty to accept modern languages as “suitable” for a Harvard education. Only Greek and Latin were deemed languages for university study.

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University Organization is a Special Culture It's Time to Add Top-Down to the Bottom Up Decision Culture

```

            graph TD
                F1[Faculty] --- D1[Dean]
                F2[Faculty] --- D1
                F3[Faculty] --- D2[Dean]
                F4[Faculty] --- D2
                F5[Faculty] --- D3[Dean]
                F6[Faculty] --- D3
                D1 --- VP1[VP]
                D2 --- VP1
                D3 --- VP2[VP]
                D3 --- VP3[VP]
                VP1 --- P[President]
                VP2 --- P
                VP3 --- P
            
```



“Laws are sand, customs are rock. Laws can be evaded and punishment escaped, but an openly transgressed custom brings sure punishment.”

“Often the less there is to justify a traditional custom the harder it is to get rid it.”

Mark Twain

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Becoming Truly Effective at Innovation Partnerships Will Require Broadening of Faculty Culture

The Last “Frontier” = Faculty Rewards, Incentives, Culture Factors

- Less emphasis on:
 - Individual scholarship
 - Control of tenure by departments
- More emphasis on:
 - Contributions to group scholarship and interdisciplinary accomplishments
 - External applications of knowledge solutions and services
- More flexibility in:
 - Job descriptions or faculty cohorts
 - Criteria for personal success
 - Blending academic and business careers
- Same emphasis as ever on:
 - Advancing basic science / research
 - Integrity and ethics in scholarship

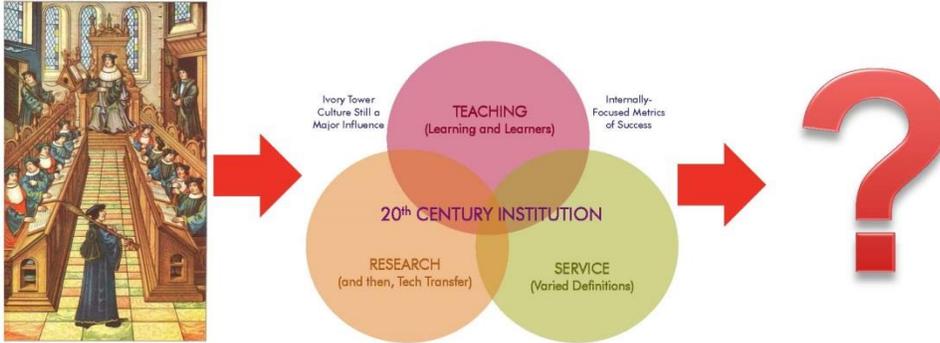



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From Medieval to 20th Century to 21st Century: Defining the 21st Century Research University



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21st Century Relevant University: Toward a Possible Definition

- More niche-building and world-class programs
- New integrated models in research—focus on solving global and local problems and extension into an innovation eco-system
- Restructuring of degree & non-degree programs—smaller chunks and ways to track a person’s lifetime credentials
- Explicit variation in delivery modes and locations
- True accommodation of varied learner constituents, *especially adults*—and seeing the *company as customer*
- Enlarged roles of faculty as professional problem-solvers
- More open, mixed-use campus environments
- Different & business-friendly academic & business culture
- Beyond just responsiveness—proactive stewardship—and taking credit for stewardship or “service”
- Entirely new metrics—from external perspective—e.g. educational attainment instead of enrollment or metrics of impacts on community



No Silver Bullet



No Magic Wand



No Ruby Red Slippers

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**Creating the Future:
A Perfect Moment to Re-Invent**

- Land-grant universities were created in the late-stage Agrarian Economy
 - A miraculous meta-idea on which great economic and social success were founded
 - Modified some for the Industrial Economy
 - And then tweaked again, to support the post-World War II NSF research model

- In the Global Knowledge Economy, everything is different:
 - The Internet changes everything
 - “Research and Innovation” is a lot MESSIER than “Research” and “Tech Transfer”— WE NEED MORE AND DIFFERENT INCENTIVES AND OUTCOME METRICS
 - Innovation and Education are intertwined
 - NDSU and its funders and partners must define and make connections between Human Capital, Innovation, and Quality of Place strategies

- This is an important moment to re-invent and re-focus NDSU’s priorities, activities, organization, greater active coordination with partners

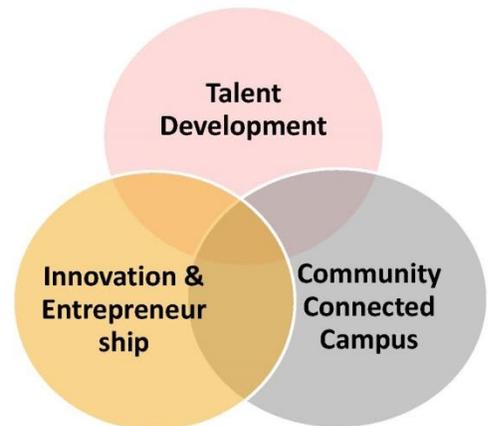
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New / Emerging Mission Paradigms



Association of Public & Land-Grant Universities
Commission on Innovation, Competitiveness
And Prosperity (CICEP)



University Economic Development Association

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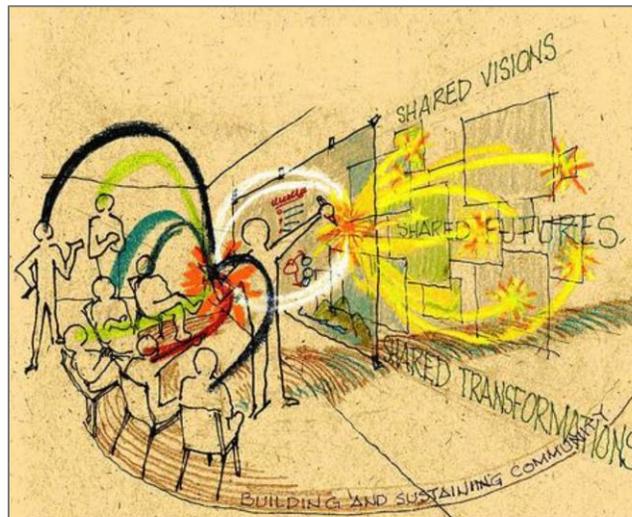


**First Decision: Defining Innovation
(Or Innovation and Engagement)**

- **Option 1: Innovation in Technology/Business Development**
 - Capture and license intellectual property from University research
 - Support start-up and early-stage companies (both OU and non-OU)
 - Provide entrepreneurship education
- **Option 2: Add Social Innovation**
 - Use university faculty/student knowledge to address social or public policy challenges of communities, regions, the State, and the global community
 - Includes government, public policy, social sciences, health, education.
- **Option 3: Add Stewardship of Place**
 - An even broader formulation—*Business Innovation + Social Innovation + Quality of Place or Competitive Communities*
 - Clear that every single discipline of the University has (or potentially has) innovation purposes and projects, as the disciplines contribute to “Place.” Thus, expressly includes the health, education, arts, humanities, etc.

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*The Relevant University:
Emerging Innovation and
Engagement Strategies
of 21st Century
Institutions*

Presentation for
North Dakota State University
and
NDSU Research Park

December 13, 2013

EKA
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Strategies for the Global Knowledge Economy

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Exhibit 3—Valley Prosperity Partnership—New Regional Plan

Material from the VPP Draft

Following is an abbreviated version of the VPP Plan from the February draft.

The Valley Prosperity Partnership

Strategic Plan 2014—2019: An Action Agenda for Sustained Prosperity
[DRAFT FOR DISCUSSION]

February 2014

Prepared by Fourth Economy Consulting

Too often economic development planning efforts are a response to an economic downturn. The need to collaborate among municipalities, coordinate planning initiatives, and leverage regional assets is considered a temporary activity—necessary only to right the ship and set a new course.

The Valley Prosperity Partnership (VPP) is not one of those planning efforts. Rather, VPP stakeholders have come together to plan and do while it is in a position of economic strength. Low unemployment, safe communities, new business investment, and growing research and development have created a level of prosperity for the Valley that is unprecedented.

Planning in times like this should represent a new and best paradigm for economic development. Prosperity brings different challenges and points of view in terms of labor supply, cost of living, and infrastructure investment. Prosperity can also allow for a longer-term vision in planning and allow for strategic investments that can have positive impacts for generations to come. If the right decisions are made today to address the challenges and invest for continued strength, future downturns can be mitigated, or even avoided altogether.

Now is the time to not only plan, but to do. The pace of economic change is becoming more rapid every day. Competition for new businesses, talent, and place-based investment is fierce and happening on a global scale. Communities that hope to compete are only as strong as the sum of their parts (and partners).

Moreover, regionalism and active collaboration among economic development intermediaries and municipalities more accurately reflects the way those who represent new investment opportunities view the world. There are no boundaries, just competitive places that can deliver the resources necessary to sustain and grow their business.

That is why it is critical that the Valley join together with industry, higher education, community, and economic development stakeholders to establish common economic development priorities, direction, and resources.

The Valley Prosperity Partnership (VPP) is a regional economic development initiative focused on “doing” just that. By identifying opportunities where the Valley can be more effective by working together, versus independently, the VPP aims to make a real and positive difference in the regional economy. The VPP will make an impact that is felt in all parts of the Red River Valley, by all of its residents and businesses over the next 5 years by building upon core strengths and high value resources, working to reduce barriers to growth, and further distinguishing the region from all others.

Moving Forward...

The Red River Valley spans the borders of Minnesota and North Dakota. The Valley is anchored by the economic centers of Fargo-Moorhead and Grand Forks-East Grand Fork and Wahpeton-Breckenridge areas. The VPP has been formed to identify common strategic economic development opportunities throughout the Valley.

The VPP is comprised of economic developers, colleges and universities, private sector businesses, community leaders, and others who recognize the importance of collaboration and leveraging resources.

The VPP is working to bring all communities in the Valley together to develop a unified, shared vision for high value and sustained economic growth for all its residents by:

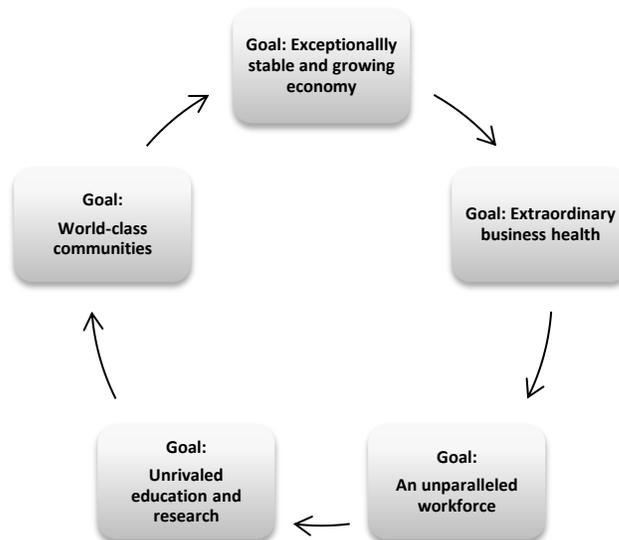
- Advocating the Valley’s interests and concerns to state and federal elected officials
- Leveraging and promoting existing resources
- Creating new programs and resources that address gaps or limitations
- Strengthening public and private sector partnerships and communication
- Building upon the accomplishments of the Red River Valley Research Corridor
- Strategically influencing current and future public policy
- Developing clear and transparent performance measures to gauge impact

Vision

The Red River Valley will *achieve and be recognized for its world-class economic performance and sustained prosperity through the success of its businesses and high quality of life.*

Goals

What defines an economically competitive and sustainable community? At its most basic level, you need talented people, great places, sensible public policies, good ideas and a diverse economic base. With those serving as guideposts, the VPP established the following goals for the Partnership. Each goal is dependent on the others.



An Exceptionally Stable and Growing Economy: The Valley's economy is highly diversified and resilient in changing economic times. A sustained and highly positive balance of trade builds wealth and fuels business expansion. Strong trade area capture keeps dollars in the Valley. Gross product expands at a steady and predictable rate.

Extraordinary Business Health: The Valley's businesses outperform their industry peers in profitability and productivity. The Valley's employers attract the nation's best talent. Leading industries (such as agriculture, manufacturing, education, and healthcare) maintain their vitality, while emerging sectors flourish. The Red River Valley leads in business innovation. The Valley's businesses lead in their social and corporate citizenship.

An Unparalleled Workforce: The Valley's workforce is highly trained and engaged. Worker skills and availability match the jobs demanded by the economy. Job opportunities are rewarding and help citizens actualize their dreams.

Unrivaled Education and Research: The Valley's educational system and institutes of higher learning perform at the top of their peer institutions, preparing learners for their roles in a high-performing economy. The Valley research corridor leads the development of innovation and applied science.

World-class Communities: The Valley's communities offer a quality of life that is unmatched in other regions of the country, with outstanding cultural, social, educational, and recreational opportunity. The Valley embraces and achieves diversity in every aspect of society. The Valley enjoys model government, high safety, excellent public health, family wellbeing, and sustainable infrastructure.

Indicators for Progress

In order to monitor the Valley's economic health and progress, the VPP has created an indicator dashboard. These higher-level metrics are associated with each of the VPP's established goals. While additional measures can be added over time or changed as needed, these initial indicators are readily accessible and updated regularly by reputable, third party sources. At the end of each year, the VPP will develop an annual economic performance report and host a networking event to evaluate the progress and suggest changes to dashboard and the strategic priority work plan as needed.

VPP Priorities

- 1. Attract, Develop and Retain Talent:** The Valley Prosperity Partnership will help to coordinate a regional, targeted talent attraction, development and retention program to ensure the Valley can meet and sustain the current and future employment demands while helping to give North Dakota, Minnesota, and the Valley a greater voice in national policy.
- 2. Ensure Water Security and Management:** The Valley Prosperity Partnership will collaborate with internal and external stakeholders to ensure that Valley's water infrastructure and management systems are fully funded, constructed and operational, effectively protecting against future flooding while providing for a readily sustainable and quality supply of water at all times.
- 3. Expand Research Capacity and Relevancy:** The Valley Prosperity Partnership will work to ensure that the Valley's universities research and technology commercialization activity is fully funded, can attract quality faculty, is relevant to regional industry and their unique competencies. Within this priority a critical focus

should be placed on the Valley's unique position at the convergence of specialized areas of technology and innovation to include unmanned aerial systems (UAS), precision agriculture, healthcare and medical services, and energy.

4. **Accelerate Entrepreneurial Activity and Output:** The Valley Prosperity Partnership will work to ensure a strong and vibrant entrepreneurial eco-system and culture exists within the Valley that cultivates, encourages and supports new business creation, innovative ideas and adds-value to existing organizations, products and services.
5. **Invest in Critical Infrastructure Development and Capital Improvement Projects:** The Valley Prosperity Partnership will identify and advocate for the continued investment in critical infrastructure development to include (but is not limited to) highways, freight-rail, natural gas, utilities, airport, broadband communication and civic space improvements for both North Dakota and Minnesota stakeholders.
6. **Define and Improve the Internal and External Perception of the Valley:** The Valley Prosperity Partnership will develop a public relations and communications strategy that creates unique messages on the Valley's strengths and opportunities to internal constituencies and external audiences while also connecting with other planning efforts in regions adjacent to or neighboring the Red River Valley.

EKA Observations on the VPP Plan

Following are a few observations about the relationship of the new VPP Plan to NDSU's *Research and Innovation* planning.

- **Mutually Reinforcing Intentions and Concepts.** It is obvious that the two scopes of work and immediate stakeholders for these two studies differed. VPP's view is regional, including the universities. NDSU's view is the University, including the region. However, based on the draft VPP Plan, it seems that the VPP leadership's intentions and those of NDSU / RTP are well-aligned and should prove mutually-reinforcing.
- **Expanding Inter-Institution Collaborations.** The VPP organization and its new Plan initiative provide a new forum through which NDSU, UND, and the ND State College of Science can further develop their collaborations.
- **Driving Economic Prosperity.** The VPP report has made explicitly clear that it expects the institutions to be drivers of future economic prosperity and quality of life for the greater Red River Valley region. The work NDSU has engaged EKA to support is exactly to the end of making NDSU's efforts more focused and increasing their impact.
- **Advocating for the Institutions' Resources.** We call attention in particular to the stated commitment by the VPP's leadership to:
 - Advocating the Valley's interests and concerns to state and federal elected officials
 - Leveraging and promoting existing resources
 - Strategically influencing current and future public policy.

Such support from the region's top leadership, especially business and community voices outside the institutions, should be especially welcome and timely, as NDSU and NDSU RTP (as well as UND and NDSCS) plan possible future legislative requests.

- **Affirming Similar Priorities.** We note that all six VPP *Priorities* address issues that surfaced through EKA's analysis and most of them connect to elements of these *Phase 1 Conclusions and Strategic Directions*. Indeed, VPP's *Priorities* and EKA's *Strategic Directions* are fully and mutually reinforcing. The difference is that the content of this EKA report does NOT yet represent adopted strategies / commitments of NDSU.
- **Focusing on Commercialization and Innovation Partnerships.** There is convergence, thus far, in emphasis on strengthening capacities for commercial applications and for various forms of university-industry partnerships:

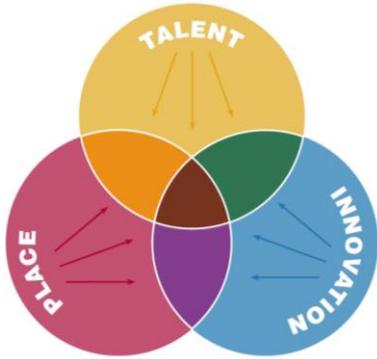
The Valley Prosperity Partnership will work to ensure that the Valley's universities research and technology commercialization activity is fully funded, can attract quality faculty, and is relevant to regional industry and their unique competencies.

- **Defining Specific Areas of Innovation as Priorities.** Because of the two-phase structure for NDSU's planning, this *Phase 1 Assessment Report* contains only a candidate list of possible areas for NDSU *Research and Innovation* priorities—as compiled by EKA and now presented for NDSU's consideration. It is intended that NDSU will further study, vet, and decide its areas of priorities during its Phase 2 planning. While NDSU may emerge from its planning process with priorities that differ from those of VPP, it is hard to imagine that there would not be at least very significant convergence or alignment, based on this VPP statement:

Within this priority a critical focus should be placed on the Valley's unique position at the convergence of specialized areas of technology and innovation to include unmanned aerial systems (UAS), precision agriculture, health care and medical services, and energy.

- **Focusing on Water Security and Management—VPP's Priority 2.** Whether or not this subject emerges as a top priority for NDSU research investment cannot be known at present. However this is an area of strength at NDSU, and NDSU should contribute to the VPP efforts in this realm.
- **Accelerating Entrepreneurial Activity and Output—VPP's Priority 4.** There is no question that there will be alignment of NDSU plan elements with this Priority 4 of VPP. The center of activity for this, and strategies to strengthen resources and outcomes, may continue to be the RTP and the RTP Incubator, with strengthened programs in both the Office of the VPR and the RTP.

Exhibit 4—North Dakota In-Migration Attributable to NDSU



During the past decade, rates of retention of NDSU baccalaureate graduates into ND placed employment has increased 10 percentage points for both graduates who report their "original home state" as ND and those who do not report their "original home state" as ND to 75.4 and 40.1%, respectively. Fifteen years ago, these rates were just below 60 and 25%; respectively.

We hope to convince NDSU that its definition of innovation and engagement should be similar to that of the APLU-CICEP emerging model. These are the three ways in which universities create economic benefit for their states and regions.

Since **Talent** (smart people) is one of the three central factor in successful 21st century economies, this growing contribution by NDSU to the State’s pool of **Talent** is, by itself, a very significant achievement in *Innovation*.

NDSU's Growing Role in Supporting In-Migration and Knowledge Work Force for North Dakota

Rates at which NDSU baccalaureate graduates who self report as employed become employed within North Dakota, segmented by those who self report ND as their "original home state" and those who do not. The rate of the two groups combined is also provided.

Year	Total Reporting as Employed	Employed in ND	% Employed in ND	ND as home state and employed	ND as home state and employed in ND	ND Retention Rate	Not employed in ND	Non-ND Home State Employed in ND	Non-ND Home State Employed in Any State	% Out of State Employed in ND (Non-ND Retention Rate)	3-Year Avg Non-ND Retention Rate	3-Year Avg ND Retention Rate	3-Year Avg Employed in ND
2013	1009	574	56.9%	473	356	75.3%	435	218	536	40.7%	40.1%	75.4%	57.7%
		provided	574/1009	provided	provided	356/473	1009-574	574-356	1009-473	218/536			
2012	900	523	58.1%	463	357	77.1%	377	166	437	38.0%	38.6%	73.6%	56.9%
2011	844	491	58.2%	435	321	73.8%	353	170	409	41.6%	38.9%	72.7%	56.2%
2010	770	420	54.5%	418	292	69.9%	350	128	352	36.4%	36.8%	70.1%	53.7%
2009	705	394	55.9%	339	252	74.3%	311	142	366	38.8%	35.9%	69.9%	53.0%
2008	897	455	50.7%	449	297	66.1%	442	158	448	35.3%	32.1%	68.6%	51.2%
2007	821	429	52.3%	431	298	69.1%	392	131	390	33.6%	30.0%	69.5%	51.5%
2006	864	437	50.6%	463	327	70.6%	427	110	401	27.4%	29.9%	68.9%	51.3%
2005	1001	516	51.5%	570	391	68.6%	485	125	431	29.0%	32.0%	68.2%	51.8%
2004	1014	524	51.7%	545	368	67.5%	490	156	469	33.3%	33.2%	67.1%	51.4%
2003	944	492	52.1%	500	342	68.4%	452	150	444	33.8%	30.5%	65.6%	48.9%
2002	922	466	50.5%	506	331	65.4%	456	135	416	32.5%			
2001	902	397	44.0%	449	283	63.0%	505	114	453	25.2%			
2000													
1999													
1998	1007	420	41.7%	520	306	58.8%	587	114	487	23.4%			
1997	945	397	42.0%	496	284	57.3%	548	113	449	25.2%			

During the past decade, rates of retention of NDSU baccalaureate graduates into ND placed employment has increased 10 percentage points for both graduates who report their "original home state" as ND and those who do not report their "original home state" as ND to 75.4 and 40.1%, respectively. Fifteen years ago, these rates were just below 60 and 25%; respectively.

Note: 3-Year Avg means three-year rolling average

Source: NDSU Career Center, e.g., <http://www.ndsu.edu/fileadmin/career/2013annualreport.pdf>

Exhibit 5—Proposed Peer Group for Research and Innovation Strategies

EKA developed a new, proposed list of peer institutions that we recommend be used in creating goals or benchmarks for Research and Innovation. The analysis was in three parts:

- An *NDSU Similarity Index*—by which we identified 15 land-grant institutions with research discipline profiles that are most similar to that of NDSU
- Including only the top 25-ranked land-grant institutions in Agricultural Sciences research
- Narrowing to only institutions whose overall Non-Medical Research Expenditures rank was lower than 35 to about 100 (NDSU is 94).

Following is information about the analysis details, and the outcome.

Step 1—*NDSU Similarity Index*

Using NSF HERD data on R&D by fields (Table 14, 2011), we calculated an *NDSU Similarity Index*—to identify institutions with distributions of research by discipline that most closely resemble that of NDSU. The *NDSU Similarity Index* was constructed in the following manner:

1. The entire of NSF NERD Table 15 was used as the base data.
2. Each institution's R&D expenditures for each discipline were normalized by converting its R&D expenditures for each discipline into a standard deviation from the mean for the all surveyed institutions. For example, NDSU's \$565,000 expenditures in Environmental Sciences is .21 standard deviations below the mean of all institutions' Environmental Sciences R&D expenditures.
3. In absolute values, we calculated the difference between each institution's normalized value for R&D expenditures for each discipline and NDSU's normalized value for each discipline. For example, if an institution's Environmental Sciences R&D expenditures was normalized to .5 above the mean, the absolute value of the difference from NDSU's normalized R&D expenditure would be 0.71 standard deviations $[(\text{abs}(-.21-.5))]$.
4. Then, we multiplied each absolute value difference by the share that the discipline represented in NDSU's mix of R&D expenditures in order to obtain a weighted average, normalized 'difference' from NDSU's R&D expenditures. For example, if Environmental Sciences represented only 0.42% of NDSU's total R&D expenditures, this category received a weight of 0.42%.
5. Finally, we added the weighted, normalized differences between the institution's R&D for each discipline and NDSU's R&D for that discipline to arrive at a final *NDSU Similarity Index*. The lower the Index value, the more similar the institution's R&D profile is to NDSU's.

Note: In the NSF data, *Life Sciences* include both Agricultural Sciences and Biomedical and other Biological Sciences. Thus, in some cases, similar values in this category mask significant differences in spending in the two main Life Science sub-categories. Texas A&M's Health Sciences Center was eliminated, because all its expenditures are in Medical Sciences.

Of these 15 concluded to be most similar to NDSU in this analysis, eight overlap with the national peer group (OIRA) and regional peer group that NDSU has been using. They are: University of Arkansas, Fayetteville, University of Idaho, Montana State University, Bozeman, University of Nebraska, Lincoln, University of Delaware, University of Tennessee Institute of Agriculture, South Dakota State University, and University of Nevada, Reno.

The table shows the 15 institutions, with their *NDSU Similarity Index* values, and their 2011 research expenditures by discipline.

The 15 Land-Grant Institutions with Research Profiles Most Similar to NDSU's Based on Calculation of "NDSU Similarity Index" Values (R&D in \$000s)—2011

Institution	NDSU Similarity Index (lower = more similar to NDSU)	Environmental Sciences (2011)	Life sciences (2011)	Math and Computer Sciences (2011)	Physical sciences (2011)	Psychology (2011)	Social Sciences (2011)	Sciences, nec (2011)	Engineering (2011)	All non-S&E fields (2011)	Overall R&D rank (2011)
North Dakota State University	0	\$565	\$74,545	\$3,054	\$16,461	\$2,895	\$14,118	\$3,529	\$17,550	\$1,347	127
University of California, Riverside	0.24	\$10,355	\$66,138	\$4,519	\$14,143	\$2,532	\$3,292	\$1,450	\$23,473	\$6,336	130
University of Arkansas, Fayetteville	0.27	\$2,814	\$65,185	\$297	\$13,621	\$387	\$3,649	\$0	\$24,357	\$9,697	135
University of Idaho	0.34	\$6,077	\$58,173	\$2,676	\$3,237	\$86	\$3,010	\$4,222	\$16,864	\$1,884	149
Kansas State University	0.35	\$679	\$109,978	\$3,626	\$11,320	\$2,307	\$5,420	\$5,799	\$24,365	\$5,673	114
Montana State University, Bozeman	0.37	\$3,681	\$52,013	\$1,587	\$20,705	\$135	\$2,416	\$10,307	\$23,400	\$11,722	133
University of Nebraska, Lincoln	0.38	\$5,179	\$102,655	\$12,196	\$19,528	\$12,791	\$12,903	\$12,561	\$42,328	\$15,155	85
Oklahoma State University, Stillwater	0.38	\$3,655	\$64,650	\$4,104	\$8,670	\$1,541	\$6,973	\$14,665	\$58,528	\$0	119
University of Delaware	0.39	\$22,443	\$39,305	\$9,063	\$19,371	\$4,306	\$10,610	\$861	\$54,544	\$9,243	113
University of Tennessee, Institute of Agriculture	0.42	\$0	\$49,389	\$0	\$0	\$0	\$5,604	\$1,725	\$6,068	\$0	180
West Virginia University	0.42	\$6,731	\$97,008	\$1,077	\$8,008	\$525	\$2,453	\$2,501	\$40,903	\$7,214	116
South Dakota State University	0.42	\$3,724	\$50,004	\$234	\$2,752	\$0	\$2,720	\$0	\$10,212	\$34	175
Auburn University	0.43	\$2,011	\$90,565	\$499	\$5,578	\$536	\$3,519	\$5,356	\$53,721	\$1,550	118
Mississippi State University	0.43	\$9,228	\$104,978	\$12,357	\$6,490	\$2,731	\$18,131	\$7,391	\$56,487	\$8,277	91
University of Missouri, Columbia	0.44	\$1,520	\$95,695	\$3,356	\$5,742	\$1,122	\$3,998	\$0	\$18,836	\$100,688	87
University of Nevada, Reno	0.46	\$12,017	\$34,025	\$1,466	\$8,184	\$314	\$2,931	\$11,251	\$16,184	\$3,368	155

NDSU Similarity Index calculated by EKA. R&D data, NSF Higher Education Research and Development Survey, 2011, Table 15

Step 2—Top 25 in Agriculture

In 2011, the year for which NSF HERD data were used, NDSU ranked 18th in Agricultural Sciences research expenditures. (We understand that NDSU now is 15th.) We thus decided to screen out any land-grant university in the bottom half of the Agriculture rankings—using only those in the top half. That list is shown in the adjacent table.

Step 3—Closest in Total Non-Medical Research Expenditures

We then excluded institutions ranked higher than 35 in Non-Medical R&D Expenditures.

Top 25 Institutions in Agriculture--2011				
Institution	Agricultural Science Rank	Overall Non-Medical R&D Rank	Total Non-Medical R&D Expenditures (\$000s)	Total R&D Expenditures (\$000s)
University of Florida	1	21	\$491,914	\$739,931
University of Illinois, Urbana-Champaign	2	14	\$545,669	\$545,669
University of California, Davis	3	13	\$546,878	\$707,896
Texas A&M University, College Station	4	6	\$705,720	\$705,720
Purdue University, West Lafayette	5	12	\$578,231	\$578,231
Washington State University	6	15	\$545,391	\$388,974
Michigan State University	7	26	\$411,298	\$454,248
Pennsylvania State University, University Park and Hershey Medical Center	8	7	\$698,031	\$794,846
Mississippi State University	9	53	\$226,070	\$226,070
Virginia Tech University	10	23	\$450,058	\$450,058
North Carolina State University	11	31	\$378,154	\$378,154
University of Minnesota, Twin Cities	12	11	\$586,191	\$847,419
Louisiana State University, Baton Rouge	13	37	\$287,841	\$287,841
Oregon State University	14	52	\$228,814	\$228,814
University of California, Berkeley	15	5	\$707,945	\$707,945
University of Georgia	16	46	\$245,166	\$245,166
Cornell University	17	18	\$511,194	\$781,651
North Dakota State University	18	94	\$134,064	\$134,064
Ohio State University	19	20	\$492,914	\$832,126
Kansas State University	20	72	\$169,167	\$169,167
University of Arkansas, Fayetteville	21	102	\$120,007	\$120,007
University of Kentucky	22	54	\$223,578	\$372,932
Iowa State University	23	59	\$203,494	\$267,641
Auburn University	24	78	\$163,335	\$163,335
University of Arizona	25	22	\$450,429	\$610,565

Note: NDSU now is ranked 15th in Agriculture. In 2011, it was 18th.
Source: NSF Higher Education and Research Survey (HERD) tables 21 and 24

The Final List—Combining Three Factors

All 24 institutions listed in the table below were generated as peer candidates in this analysis. All the institutions shaded in greens or blues in the table below are the institutions that EKA concluded were current peers; aspirational peers; or useful as case studies/examples of program strategies.

Array of Current Peers, Aspirational Peers, and Case Study Universities, Based on *NDSU Similarity Index*, Agricultural Sciences Rank, and Overall Non-Medical R&D Rank (NSF 2011)

Institution	NDSU Similarity Index	Agricultural Science Rank--2011	Overall Non-Medical R&D Rank--2011	Current Peer?	Aspirational Peer?	Case Study?
North Dakota State University	0	18	94			
University of Arkansas, Fayetteville	0.269401	21	102	yes		
Kansas State University	0.351254	20	72	yes		
Auburn University	0.426109	24	78	yes		
Mississippi State University	0.430446	9	53		yes	
Iowa State University	0.504741	23	59		yes	
Oregon State University	0.539537	14	52		yes	
Louisiana State University, Baton Rouge	0.643164	13	37		yes	
University of Georgia	0.740815	16	46		yes	
North Carolina State University	0.913625	11	31			yes
University of Kentucky	1.132839	22	54		yes	
Virginia Tech	1.197977	10	23			yes
Washington State University	1.306851	6	15			yes
University of Illinois, Urbana-Champaign	1.585884	2	14			
Michigan State University	1.58745	7	26			
Purdue University, West Lafayette	1.629328	5	12			
Texas A&M University, College Station	1.653772	4	6			
University of Arizona	2.407202	25	22			
University of California, Davis	2.476407	3	13			
Pennsylvania State University, University Park and Hershey Medical	2.524383	8	7			
University of Florida	2.547527	1	21			
University of California, Berkeley	2.656153	15	5			
Ohio State University	2.842265	19	20			
Cornell University	3.107675	17	18			
University of Minnesota, Twin Cities	3.197185	12	11			

 = Current Peer  = Aspirational Peer  = Case Study (Best Practices)

Source: EKA Analysis and NSF Higher Education and Research Survey (HERD)

In general, EKA wanted to select institutions whose *NDSU Similarity Index* was at least less than 1.0.

We made one exception—eliminating NC State University with an *NDSU Similarity Index* of .9, due to its much higher overall research rank. We decided to include instead University of Kentucky, with a slightly greater *NDSU Similarity Index* of 1.1—because UK's other characteristics were more suitable than NC State's.

We wanted to select those whose Agricultural rank was in an appropriate range—and thus narrowed from the top 25 to select institutions that rank from 9th (Mississippi State University) to 24th (Auburn University)—roughly the second quartile of Agriculture rankings.

Finally, we did not want to include institutions that are too distant (much higher up) from NDSU in overall Non-Medical Research Expenditure rankings. We included institutions that ranked from 37th (Louisiana State University) to 102nd (University of Arkansas, Fayetteville)—with NDSU at 94th.

Exhibit 6—NDSU Strategic Planning Committee Material, 2011

DRAFT / June 1, 2011

Introduction

The Strategic Planning Committee, representing university faculty, staff, and administrators, envisions North Dakota State University as a comprehensive and diverse institution with the characteristics of a top-20 research university that impacts the region, nation, and the world. As a student-focused Land Grant research university, we believe that we are uniquely positioned to achieve this vision.

Pursuant to the charge given to us by the President to identify key characteristics of programs that had achieved or had the potential to achieve excellence, three areas were identified as being integral to excellence in academic and research programs across disciplines. In all cases, the ability to attract and retain high-quality students and faculty, to give those individuals the tools they need to realize their potential, and to demonstrate the impact of the program in the region, nation, or world defines an excellent program. The top 20 nationally recognized programs in their respective disciplines were chosen as the standard of excellence.

A clear recognition that human, physical, and technical infrastructure support is critical for excellent programs to flourish and programs with great potential to achieve excellence resonated at every level of committee discussion. A university plan for infrastructure improvement and maintenance was seen as a foundational step in achieving and sustaining excellence. The committee strongly recommends that an independent development foundation dedicated to academics and research be established to realize the vision achievable by reaching the criteria listed below. In addition, the committee recommends that the existing Honors Program be bolstered and increase its offerings with the ultimate aim of converting it to a residential Honors College. Moreover, international experiences, both on campus and abroad, will be essential to providing exposure to diversity required to address ever-increasing economic, health-related, political, and social globalization.

Criteria for Enhancing NDSU's Excellence in Academic and Research Programs

With the top 20 nationally recognized programs in one's discipline as a benchmark, one can compare both a program's past record of success and the capacity for improvement based on the following three criteria...

1. HUMAN CAPITAL

Establishing NDSU as the university of choice for an array of diverse, meritorious students

- For undergraduate students, evidence may include ACT or SAT scores, high school GPA, class rank, number of valedictorians/salutatorians, eligibility for honors program, National Merit Scholarships, and other program-specific criteria.
- For graduate students, evidence may include GRE scores, prior GPA, prescribed criteria for recruitment and selection of students, and other program-specific criteria.

Establishing NDSU as the university of choice for a diverse, world-class faculty

- For early career faculty, evidence may include academic pedigree, success in training, and early indicators of success in the discipline.

- For established career faculty, evidence may include meritorious recognition in the discipline at the regional, national, and/or international level.
- For both early and later career faculty, evidence may include early promotion and tenure, awards received, special appointments, endowed chairs, ability to recruit graduate students and visiting scholars.
- For the academic unit, the retention of outstanding faculty

2. OPPORTUNITY

Support for academic opportunities

- Evidence for recruiting and retaining excellent students in undergraduate programs may include innovation in training, internships, national and international travel opportunities, research experiences and creative activities, leadership opportunities, scholarship of teaching, distance teaching and learning, and other program-specific criteria.
- Evidence for enhancing academic graduate programs may include graduate assistant positions with competitive stipends and health benefits, professional development programs, research experiences and creative activities, national and international travel opportunities, networking opportunities, leadership training, distance teaching and learning, and other program-specific criteria.
- Evidence of enhanced outreach activities

Support for creative activities and research opportunities

- Evidence of human infrastructure to support the excellent programs or the creation of unique programs may include new faculty positions; appropriate faculty time to develop synergistic relationships between disciplines; qualified professional staff for performance and gallery spaces, research laboratories, and core laboratory facilities; sufficient administrative support (secretarial, grant writing, budget development, support personnel for exhibit and performance spaces, and/or other logistical support); and other program-specific criteria.
- Evidence of support for the human infrastructure to create and sustain excellent programs or the creation of unique programs may include startup packages, operating funds, and the creation of opportunities for national and/or international professional development.
- Evidence of physical infrastructure to support creative and research activities may include appropriately outfitted research or studio space, teaching space, office space, and other program-specific criteria.
- Evidence of technical infrastructure support may include equipment, equipment service contracts, and space and support for core facilities.
- Evidence of leveraging uniqueness

3. OUTCOMES

Results emanating from the input of human capital and the leveraging of opportunities

Evidence of the impact of the program on the state, region, nation, and/or world may be expressed in a number of ways and may include:

A. Scholarly Distinction

- Accreditation of programs
- Student performance on certification examinations, honors and awards received
- Graduate placement in field or continuing education
- Sustained peer-reviewed publication record

- Sustained peer-reviewed and/or juried creative activities
- Establishment of collaborative and multi-disciplinary efforts regionally, nationally, and internationally
- Number of university distinguished professors/endowed chairs or programs
- Nationally and/or internationally recognized faculty
- Membership in one of the National Academies or equivalent distinction
- Diversity
- Demonstration of impact in the field
- Establishment of new and leading areas of research
- Patents

B. External Support

- Amount of external funding
- Diversity of external funding
- Sustained funding
- Meaningful and productive academic/business/industry/non-profit collaborations

C. Contributions to North Dakota and beyond

- Number and quality of outreach activities
- Meaningful and productive academic/business/industry/non-profit collaborations
- Recognition as a regional, national, and/or global resource
- Economic development, such as spin-off companies or increasing tourism
- Workforce development for the 21st century
- Fulfillment of Land Grant mission

Strategic Planning Committee Members

Committee

Anderson, Dennis, Associate Vice President –Research, Creative Activities, and Technology Transfer
Brown, Paul, Senior Lecturer – College of Business
Chisholm, Bret, Senior Research Scientist – Vice President for Research, Creative Activities, and Technology Transfer
Clark Johnson, Virginia, Dean – College of Human Development and Education Council
Fitzgerald, Margaret, Associate Professor – College of Human Development and Education
Grafton, Ken, Dean – College of Agriculture, Food Systems, and Natural Resources
Heuer, Loretta, Associate Dean – College of Pharmacy, Nursing
Hvidsten, Marie, Rural Leadership Specialist, NDSU Extension Service – Facilitator
Isern, Tom, Distinguished Professor – College of Arts, Humanities, and Social Sciences
Johnson, Ron, Dean – College of Business
Katti, Dinesh, Professor – College of Engineering and Architecture
Martin, William, Professor/Unit Head – College of Human Development and Education
Maylath, Bruce, Professor – College of Arts, Humanities, and Social Sciences
Miller, Donald, Professor/Chair – College of Pharmacy, Nursing, and Allied Sciences
O'Connor, Amy, Associate Professor – College of Arts, Humanities, and Social Sciences
Reynolds, Larry, Distinguished Professor – University Distinguished Professors
Schauer, Chris, Center Director – Vice President for Agriculture and University Extension
Schuh, Jane, Assistant Professor – College of Agriculture, Food Systems, and Natural Resources
Sibi, Mukund, Distinguished Professor – College of Science and Mathematics
Smith, Gary, Dean – College of Engineering and Architecture
Tweten, Margaret, District Director – Vice President for Agriculture and University Extension

Ex-Officio/Advisory Members

Beehler, Jace, – Students
Hauck, Lisa, Director – International Programs
Mayfield, Galen, Exec Director, Enterprise Computing & Application Development Information Tech
Oster-Aaland, Laura, Director for Orientation and Student Success – Student Recruitment/Retention
Reid, Michele, Dean – Libraries
Wittrock, David, Dean – Graduate School

Exhibit 7—ND Centers of Excellence at NDSU and Other NDSU Centers / Institutes

All Listed Centers and Institutes

The following information is from NDSU web pages, sorted by year in approximate timeframes, and indicating formal approvals, where applicable.

It is clear that, apart from the very longstanding Agriculture-related centers and institutes, there were relatively few up to 2000. There has been a great acceleration in the formation of centers and institutes since then, several, from 2006 to 2013, under the COE Program.

A comprehensive list of NDSU Centers and Institutes is provided on this page and on the next page.

There is undoubtedly great variation in the size, scope, funding potential, and impact achieved among these centers and institutes. For some, we were unable to find a webpage, and thus, we did not find not even basic information for this preliminary review.

(more)

Centers and Institutes at NDSU		
Name of Center or Institute	Approved by (if applicable)	Year / Approx Year
EARLY		
Agricultural Experiment Station Labs, Centers, and Institutes		Early
Agricultural Experiment Station Research Extension Centers		Early
MID-CENTURY (1950s - 1970s)		
Institute for Regional Studies	NDSBHE	1950
ND Water Resources Research Institute	NDSBHE	1965
Upper Great Plains Transportation Institute	ND legislature, 1967	1967
Germans from Russia Heritage Collection		1978
Center for Social Research (part of Institute for Regional Studies)		1970s
Plant Diagnostic Lab		1970s?
1980s - 1990s		
Northern Crops Institute	ND Legislature, Century Code, Chapter 4-14.2	1981
Computer Systems Institute		1981
Emily P. Reynolds Historic Costume Collection		1984
Institute for Natural Resources and Economic Development		Mid-1980s; name change
Institute for Business and Industry Development	NDSBHE	1989
Quentin Burdick Center for Cooperatives	NDSBHE	1992
ND Kids Count		1994; transferred from UND 2003
ND Institute for Pharmaceutical Care	NDSBHE	1996
Center for Science and Mathematics Education	NDSBHE	1998
2000s		
Bio-imaging and Sensing Center	NDSBHE	2000
Bison Center of the Northern Plains	NDSBHE	2000
Center for 4-H Youth Development	NDSBHE	2000
Center for Rural Studies (joint with UND)	NDSBHE	2000
Great Plains Institute of Food Safety	NDSBHE	2000
ND Agricultural Weather Network Center (NDAWN)	NDSBHE	2000
Northern Plains Ethics Institute	NDSBHE	2000
Center for Agricultural Policy and Trade Studies (formerly Northern Plains Policy and Trade Research Center)	NDSBHE (Name Change)	2001
Center for Nanoscale Science and Engineering	NDSBHE	2002
Center for Nutrition and Pregnancy (CNP)	NDSBHE	2002
Value-Added Processing Center	NDSBHE	2002
Center for Computationally Assisted Science & Technology (formerly Center for High Performance Computing)	NDSBHE	2003
Center for Community Vitality	NDSBHE	2004
Center for Visual and Cognitive Neuroscience	NIH COBRE	2004
Institute of Barley and Malt Sciences	NDSBHE	2005

Centers and Institutes at NDSU		
Name of Center or Institute	Approved by (if applicable)	Year / Approx Year
Center for Advanced Electronics Design and Manufacturing	ND-COE	2006
Center for Surface Protection	ND-COE	2006
Oilseed Development Center of Excellence	ND-COE	2006
Center for Heritage Renewal (part of Institute for Regional Studies)	NDSBHE	2006
Beef Systems Center of Excellence	ND-COE	2007
NDSU Technology Incubator	ND-COE	2007
Applied Plant Breeding Institute	NDSBHE	2007
Center for Global Initiatives	NDSBHE	2007
Bio-Energy and Products Innovation Center		2007
Center for Disaster Studies and Emergency Management	NDSBHE	2008
Center for Biopharmaceutical Research and Production	ND-COE	2009
Center for Integrated Electronic Systems	ND-COE	2009
2011 - 2013		
Center for Sensors, Communications, and Control	ND-COE	2011
Center for Life Sciences Research and Applications	ND-COE	2012
Center for Technologically Innovative Products and Processes	ND-COE	2012
Center for Biobased Materials Science and Technology (BiMat)	ND-COE	2013
Center for Professional Selling and Sales Technology	NDSBHE	2013
DATE NOT FOUND--SOME LIKELY EARLY, SOME MORE RECENT		
Center for Protease Research	NIH COBRE	No Date Found
Center for Child Development		No Date Found
Center for Community Planning and Design		No Date Found
Center for Nanoscale Energy-Related Materials		No Date Found
Center for Natural Resource and Agroecosystem Studies		No Date Found
Electron Microscopy Center		No Date Found
Engineering Research Center		No Date Found
Family Therapy Center		No Date Found
Forensic DNA Facility		No Date Found
FORWARD (Focus on Resources for Women's Advancement, Recruitment / Retention, and Development)		No Date Found
Group Decision Center - part of Northern Plains Ethics Institute		No Date Found
International Water Institute		No Date Found
ND Veterinary Diagnostic Laboratory		No Date Found
NDSU University Archives		No Date Found
Robert Perkins Engineering Computer Center		No Date Found
Small Business Institute		No Date Found
Center for Advanced Technology Development & Commercialization	ND-COE	No Date but Recent
http://www.ndsu.edu/research/centers_and_institutes.html		
Dates noted in red were found on the center's webpage.		

Centers of Excellence

Following is a summary of readily-available information for those centers supported under the State’s *Centers of Excellence Program* (CoE), funded from 2006 through 2013. (That program now has been revamped as *Research North Dakota*.) Some of these have been more successful than others. Some further evaluation, in greater detail than this study’s scope permits, may be useful.

Centers of Excellence at NDSU—Summary of Purposes, Funding, and Current Status				
CoE	CoE Program Funding	Matched/ Leveraged Funding	Purposes / Description	Status in 2014
Center for Advanced Electronics Design and Manufacturing (CAEDM) 2006	\$3,000,000	\$12,400,000	Assists industry partners and collaborators in meeting product and technology needs with research that results in new marketable technologies and products, and stimulates market opportunities Produces low volume prototype electronics components Promotes development of new products and technologies in advanced electronic & manufacturing cluster Enables and fosters commercialization opportunities of new technologies and products. Focuses on market-driven research and development to promote creation of high-value jobs and economic development opportunities	<u>Components of CAEDM at NDSU:</u> Design and development of innovative electronic prototypes Intellectual property available for licensing to private sector <u>CAEDM Partners:</u> Aldevron, Fargo, ND Intelligent InSites, Inc. Fargo, ND Alien Technology, Morgan Hill, CA Pacific Northwest National Lab, Richland, WA Appareo Systems, Fargo, ND Pedigree Technologies, Fargo, ND Bobcat Company, Gwinner, ND PPG Industries, Pittsburgh, PA Crane Wireless Monitoring Solutions, Plano, TX Tessera Technologies, Inc., San Jose, CA Deceleration Technologies, LLC, Reynolds, ND
Center for Surface Protection 2006	\$4,000,000	\$4,700,000	Create, develop and test organic and inorganic soft and hard coatings and application methods Perform studies in corrosion control and corrosion detection Conduct specialty tests, measurements and analysis for research partners and collaborators to assist them in meeting their needs Perform accelerated exposure tests Provide technical consulting services for research partners and collaborators	No information on status
Oilseed Development 2006	\$3,500,000	\$14,300,000	No information found on website	No information on status
Beef Systems 2007	\$800,000	\$2,000,000	No information found on website	No information on status
NDSU Technology Incubator 2007	\$1,250,000	\$5,000,000	Described in Section 5--Assessment of NDSU Research Park	Information in Section 5

Centers of Excellence at NDSU—Summary of Purposes, Funding, and Current Status				
CoE	CoE Program Funding	Matched/ Leveraged Funding	Purposes / Description	Status in 2014
Center for Biopharmaceutical Research and Production, 2009	\$2,000,000	\$4,740,000	Discover and develop new and enhanced biopharmaceuticals, vaccines and diagnostics using best practices of industry and academia in order to stimulate growth of a stronger and larger biopharmaceutical industry in North Dakota.	Matched/leveraged funding is projected.
Center for Integrated Electronic Systems 2009	\$2,050,000	\$4,100,000	Provides expertise in software and firmware development in a variety of vertical markets including enterprise resource planning, location-based services, machine-to-machine communications, RFID systems and machine control. Our engineering team has expertise in JAVA, PHP, .NET, Linux, and various embedded systems environments and assembly coding Assists industry partners and collaborators in creating and manufacturing new marketable technologies and products Promotes development of new products and technologies in embedded systems and other electronic systems Enables opportunities to commercialize new technologies and products Focuses on market-driven research and development to promote creation of high-value jobs and economic development opportunities	Bobcat / Doosan Firmware systems for ruggedized electronic systems Gwinner, ND Intelligent InSites Healthcare asset management service software Fargo, ND Datacom International, Inc. Engineering resource planning software Bloomington, MN Pedigree Technologies Wireless sensor networks Fargo, ND
Center for Sensors, Communications, and Control 2011	\$2,800,000	\$5,600,000	CSCC will be organized within NDSU’s Center for Nanoscale Science and Engineering at the NDSU Research and Technology Park. The Center will provide expertise in core areas of JAVA programming, sensor integration and systems engineering that selected partners are lacking.	Matched/leveraged funding is projected. Information from press release, 29 June 2010 No information on status.
Center for Advanced Technology Development & Commercialization (No launch date given)	\$3,900,000	\$7,800,000	CATCOM will assist private-sector partners in commercializing inventions, new technologies and other intellectual property discovered or created by NDSU faculty, staff and students or private-sector partners.	Matched/leveraged funding is projected. Information from press release, 29 June 2010 No information on status.

Centers of Excellence at NDSU—Summary of Purposes, Funding, and Current Status				
CoE	CoE Program Funding	Matched/ Leveraged Funding	Purposes / Description	Status in 2014
Center for Life Sciences Research and Applications 2012	\$1,350,000	\$2,700,000	Combine resources and capabilities of multiple private sector partners interested in the life sciences, with NDSU's research and development capabilities for life science-related technology or product development. Sanford Research, headquartered in Sioux Falls, SD, and Fargo, plans to partner with the new Center for Life Sciences Research and Applications at NDSU for research on human genomics and bioinformatics. Initial focus is expected to include breast cancer research and research into certain rare diseases in children.	Matched/leveraged funding is projected. Information from press release 16 February 2012 No information on status.
Center for Technologically Innovative Products and Processes, 2012	\$320,000	\$640,000	Partner with industrial companies such as Mid-America Aviation, Amity Technology, and Arkema, Inc., assisting with product research, testing, evaluation and analysis.	Matched/leveraged funding is projected. Information from press release 16 February 2012 No information on status.
Center for Biobased Materials Science and Technology (BiMat) 2013	\$1,132,500	\$2,265,000	No descriptive information.	Matched/leveraged funding is projected. No information on status.
Total Actual & Expected Funding	\$26,102,500	\$66,245,000		If the full matching and leveraged funding all materializes, then these COEs will have generated \$2.50 for every state \$1.00.

Exhibit 8—Details of Services Provided to Park / Incubator Companies

The following is summarized from Park documents, as services provided variously to Park / Incubator tenants.

- Grants or Investments
 - Technology Based Entrepreneurship Grants
 - Agricultural Products Utilization Commission Grant
 - North Dakota Development Fund funding
 - New Jobs Training Agreement funding
 - Fargo Moorhead Angel Investment Fund investments
 - INNOVATE ND winner grants
- Coaching / Mentoring Board meetings [estimated dollar values provided in some cases]
 - Assistance by Coaching / Mentoring Board in recruiting a CEO
 - “Additional Coaching” (some with high dollar value assigned)
 - Coaching (by incubator staff)
- Educational Events & Forums
 - QuickBooks 1 & 2
 - Social Media
 - Innovation Week
 - Small Business Benefits
 - Sales & Marketing
 - Organizational Leadership
 - Intellectual Property Seminar
 - Shipping: Tips for Managing Freight for Small Business
 - Financial Statements
 - Accessing NDSU Career Center
 - Microsoft Tech Talk
 - Bank of North Dakota / North Dakota Development Fund Roundtable Discussion
- Outside Service Providers
 - Legal, Accounting & Network Time (donated)
- Student Employment
 - Student help
 - NDSU Capstone Project
 - Summer Intern hiring assistance
 - EPSCoR funded student interns
- Arranging business and industry contacts
- North Dakota Trade Office introductions and meetings
- NDSU Contracts and Partnerships (e.g. Bobcat)

Exhibit 9—Innovation Week / Innovation Challenge

The RTP's showcase event is *Innovation Week*, now in its fifth year and run as a partnership between the NDSU Office of the Provost and RTP, with RTP is the administering entity.

The purpose of *Innovation Week* is to:

- Encourage students to be innovative thinkers
- Enhance student awareness for innovation as a precursor to entrepreneurship
- Empower students to pursue entrepreneurship as a career choice
- Expand student access to resources available for innovators and entrepreneurs
- Engage the current entrepreneur and business communities with students

A Steering Committee led by NDSU's Provost includes deans from all colleges, RTP staff, representatives of the NDSU Research Foundation and student government. A Working Committee meets on a weekly basis comprised of representatives from the NDSU community including Media Relations, Memorial Union, College of Engineering, NDSU Research Foundation, ITS, Student Government, College of Business and Park staff.

Innovation Week features the *Innovation Challenge* competition (now in its 3rd year), open to all NDSU students. The competition focuses on the innovative work being done on campus by NDSU students, as represented by executive summaries, posters and oral presentations for judging. Criteria focus on all aspects of innovation.

In the months leading up to the *Innovation Challenge*, several boot camps are held for participants, focused on topics such as writing an executive summary, preparing a poster, tips for an effective presentation, filing provisional patents, and FAQ about intellectual property.

Illustrative Boot Camp Topics and speakers for 2014 included:

- September 24th Life is Short, Break the Rules—creative thinking
 - Jonathan Tolstedt, Appareo Systems
- October 29th Market Assessment: Who Are My Customers and Where Do I Find Them
 - Eric Piela, Flint Communication
- November 19th Finding Talent For Your Team
 - David Batcheller, Appareo Systems
- January 21st Sales and Marketing (TBD)
- February 18th Entrepreneurial Experiences (TBD)
- March 4th Show Me the Money with Angel Investing
 - James Burgum, Arthur Ventures

Beginning in 2013 the North Dakota Corn Growers Association became a major financial sponsor of *Innovation Week*, resulting in the addition of a Corn Track, to encourage students to think of innovative ways to use corn.

Innovation Week includes a nationally prominent kick-off speaker, as well as a keynote speaker at the concluding awards ceremony. Cash prizes are awarded by NDSU's President and Provost at the awards ceremony, in the following categories:

- Corn Track: \$5,000, sponsored by the North Dakota Corn Growers Association
- Intangible Track: \$5,000
- Tangible Track: \$5,000
- People's Choice Award: \$1,000
- Grand Prize Winner: \$5,000.

ND Corn Growers Association

The North Dakota Corn Growers Association's various forms of engagement with NDSU and with NDSU RTP exemplify the multiple dimensions and benefits that can result from well-structured industry partnerships.

Are there, or could there be, more long-term linkages with other industry associations?

Exhibit 10—Web Page Portal Examples

NC State University—Emphasis on Partners

Note that *Partners* appears on the NC State home page, as a Main Menu item. Also note *Partnership Concierge*. The link to *Centennial Campus* (equivalent of NC State’s research park) takes the browser to information about the mixed-use site.

NORTH CAROLINA STATE UNIVERSITY FIND PEOPLE | LIBRARIES | NEWS | CALENDAR | MYPACK PORTAL | GIVING | CAMPUS MAP

NC STATE UNIVERSITY

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 - University Collaboration
 - JimmyV
- » ABOUT NC STATE
- » ACADEMICS
- » CAMPUS LIFE
- » RESEARCH
- » OUTREACH
- » ATHLETICS

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Partners

NC State wants to help turn your ideas into reality.

Whether you are a small business, an international corporation or a government agency, our faculty have expertise that can help you operate more effectively and guide your ideas from the drawing board to the marketplace. Our students are your future workforce. And our Centennial Campus, the nation's premier research park, can help everything from your offices to your laboratories.

Whatever your needs, NC State can help. We're ready when you are. Get started by contacting the [Partnership Concierge](#) at 919-515-7036 or concierge@ncsu.edu.

Partnership is simple.

- » The [Partnership Concierge](#) is your one-stop shop for partnering with NC State.
- » The NC State [Economic Development Partnership](#) can help you spur growth.
- » Partnership opportunities abound on [Centennial Campus](#).

Partnership in action.

- » [Pentair Water Pool and Spa](#) is partnering with several NC State colleges to develop more efficient pool pumps and filtration systems.
- » [Phononic Devices](#), an early-stage company, is working the College of Engineering to create innovative thermoelectric products.
- » Built on technology pioneered at NC State, [WebAssign](#) hires students and provides services to departments and colleges.
- » The [Nonwovens Institute](#) brings together government, business and the university to drive innovation in research, training, education and economic development in an emerging industry.

Was this information helpful? [Yes](#) | [No](#)

Partnerships

Partnerships keep NC State students and faculty at the forefront of industry development.

Partnership Concierge

INNOVATION THIS IS OUR WORK.

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HELPFUL LINKS

- » [Centennial Campus](#)
- McKimmon Center for Extension and Continuing Education
- Research, Innovation and Economic Development

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University of Maryland—Emphasis on Innovation

Note that *Innovation* is a Main Menu item on the University of Maryland home page.



Then, the *Innovation* page is shown below. This page provides the following menu items, *Academy*, *Academic Programs*, *Competitions and Events*, *University Resources*, and *Fast Facts*. Note also that UMD is branding something they call *Fearless Ideas*. UMD has accumulated all its innovation-focused content in this one place. All of this is worth reviewing, at <http://www.innovation.umd.edu/>



The University of Maryland is a premier innovation and entrepreneurship institution.

We are a community of faculty, staff, students and alumni dedicated to inspiring, developing and launching Fearless Ideas, the heart of innovation and entrepreneurship. Every corner of our campus, from the sciences and humanities to research and business, is committed to this vision. On this site, you will find over 50 university resources, services, contests and challenges to help inspire, develop and launch Fearless Ideas. Because we believe Fearless Ideas ignite bold invention, drive passionate leaders and inspire social change.

Got a Fearless Idea? Start Here!

Get feedback and advice on strategy, testing, funding and landing your idea in the world. We have big plans for your big plans.

[CLICK HERE for Innovation Fridays locations!](#)



The content of the *Academy* page is provided here below, as an example.

Note also the title of UMD’s Chief Innovation Officer: *Associate Vice President for Innovation and Entrepreneurship*

Academy for Innovation and Entrepreneurship at the University of Maryland

Welcome to the Academy for Innovation and Entrepreneurship at the University of Maryland. The Academy is a signature initiative to infuse the University with a culture of innovation and entrepreneurship across all colleges, building on the institution's excellence as a research university.

Our mission is to support both the curricular and experiential education of all students so that they are inspired and empowered to translate creative ideas into enterprising solutions that solve problems whether economic, societal, technological, or cultural and thereby create value. The Academy embodies the core land-grant university ideal of putting knowledge into action. This is where ideas—Fearless Ideas—are transformed to impact.

The Office of the President and the Office of the Provost created the Academy to underscore the continual commitment this University has to make an impact on the lives of students and faculty so that they can make positive difference in the world. There is already an incredible foundation of entrepreneurial courses and programs here, built over 25 years. Our goal is to build on that foundation to grow existing, successful programs and to launch new courses and initiatives to address new needs and opportunities.

Exciting new initiatives are coming soon, but in the meantime, there are dozens of exciting entrepreneurial programs, events and competitions across campus year-round. We encourage everyone to learn more about such programs as Innovation Fridays, UMD Startup Boot Camp, Cupid's Cup, Social Value Symposium, Do Good Challenge, UMD Business Model Competition, ACC Clean Energy Challenge, and the annual Invention of the Year. Details on all of these programs—and more—can be found on this website.

Sincerely,

Dean Chang

Associate Vice President for Innovation and Entrepreneurship

Exhibit 11—Entrepreneurship Education Program Rankings

Princeton Review and Entrepreneur Magazine rankings found at <http://www.princetonreview.com/top-entrepreneurial-colleges.aspx>



Top 25 Undergraduate Schools for Entrepreneurship Programs	Top 25 Graduate Schools for Entrepreneurship Programs
1. Babson College	University of Michigan--Ann Arbor
2. University of Houston	Babson College
3. University of Southern California	Harvard University
4. Syracuse University	Rice University
5. Baylor University	University of Virginia
6. The University of Oklahoma	Stanford University
7. Stanford University	The University of Texas at Austin
8. Washington University in St. Louis	Brigham Young University
9. Brigham Young University	The University of North Carolina at Chapel Hill
10. Northeastern University	University of Southern California
11. University of Missouri-Kansas City	University of Chicago
12. Miami University	Washington University in St. Louis
13. Temple University	University of Washington
14. Clarkson University	University of Arizona
15. University of Maryland-College Park	University of Oklahoma
16. The University of North Carolina at Chapel Hill	University of Maryland-College Park
17. University of Arizona	The University of South Florida
18. University of Dayton	University of Louisville
19. Bradley University	Temple University
20. Lehigh University	University of Missouri-Kansas City
21. University of Iowa	Columbia Business School
22. Texas Christian University	Oklahoma State University
23. Saint Louis University	University of Utah
24. DePaul University	New York University
25. City University of New York - Baruch College	The George Washington University



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