An Innovation Economy Strategy for Metro Milwaukee

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(*Prospective*) Endorsement:
This white paper represents one part of the larger "Milwaukee 7" economic strategy initiative. While descriptive of current state of the innovation economy in Metro Milwaukee, it also proposes broad new program initiatives for the region that, if launched together over the next five years, would transform the regional innovation economy. This paper has been vetted through the processes of authorship, editing, and round table discussions; and is (*prospectively*) endorsed by the following individuals (presented alphabetically):

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Summary

Metro Milwaukee ranks 48th out of the 50 largest cities in the United States on per capita measures of the innovation commercialization index. This index is derived from three simple measures: SBIR/STTR grants, venture capital investment, and IPOs. More importantly, it reflects the activity level of an entrepreneurial culture that is engaged in an innovation economy continuum: generating ideas, which turn into innovations, which are incorporated in local startups, funded with seed, early and later stages of venture capital, to grow successfully to become public companies. When this deal flow works well – as it does in a few metro areas in the US – it will generate wealth, jobs and a better standard of living.

This deal flow continuum is disconnected in Metro Milwaukee. The easiest and most logical place to direct efforts to develop deal flow is at the earliest stages. Metro Milwaukee research institutions have a unique strength in biomedical research, which represents a vast field of developing knowledge and opportunities for developing innovations that are appropriate to incorporate into startups and fund with venture capital. In terms of federal funding of civilian research, the majority is focused on biomedical and health applications.

Metro Milwaukee research institutions currently attract approximately $150 million a year in research funding, led by the Medical College of Wisconsin. The research institutions have shown an important willingness to collaborate in research activities and in the TechStar initiative, which has enabled the institutions to establish leading metrics for spinouts per research dollar. As generators of innovative ideas, research institutions are an essential component of Metro Milwaukee's future economy. However, in comparing comparable metro areas, we conclude that the research expenditures of this community should be expanded by a factor of 2 to 3 times what they are today.

However, academic research by itself will not increase the innovation commercialization index of the metropolitan area; it must be tied to an entrepreneurial, smart and comprehensive system of moving inventions – in the form of patented technologies – into the private sector. The economic development value of licensing intellectual property to out-of-state companies is negligible; however, the ability to push the same intellectual property to local startups has the effect of beginning the kind of deal flow that has been the source of significant wealth creation for some of the strongest metro economies in the U.S. Metro Milwaukee should continue to support and develop the kind of technology transfer programs at our research institutions that can push intellectual property to startups.

Innovations require funds to translate to new ventures. Metro Milwaukee must develop continuing sources of research funding to stimulate collaborative, interdisciplinary, translational research. Finally, Metro Milwaukee needs to develop local seed fund sources that enable the formation of companies and the recruitment of skilled entrepreneurs to the region.

With this background, which is developed further in this innovation economy whitepaper, the authors recommend developing and supporting the following strategic initiatives:

1. **BTA Endowed Chairs Program.** Growth in research and growth in the innovation commercialization requires leaders. The research institutions should be funded to hire new interdisciplinary and entrepreneurial faculty members. The goal is to hire 4 new lead investigators per year in BTA endowed chairs starting in 2007 and lasting through 2011. Anticipated cost: $16 million per year for five years = $80 million.

2. **Follow-on Funding for Collaborative Grant Program.** The BTA Collaborative Grant Program grows academic research in Metro Milwaukee and provides funding for the kind of translational research that creates startup opportunities. Planning for the second phase of the collaborative grant program should begin now for distribution of funds between 2007 and 2011. Anticipated cost: $14 million per year for five years = $70 million.

3. **Develop Institutional Tech Transfer Programs.** The areas technology transfer programs need continuing support of resources that push university research to spinouts. Tech transfer programs which produce quality startups are Metro Milwaukee's most promising source of deal flow. Metric goal: at least 8 spinouts for every $100 million in research from 2007 through 2011. Anticipated cost: $800,000 per year for five years = $4 million.

4. **Support for SBIR/STTR Grant Coach.** The SBIR/STTR program is one of the largest funds for translating research to startups in the world. The Metro Milwaukee area should maintain funding for a skilled SBIR/STTR grant coach that is well-versed in both science and business, who can help develop a strong pipeline of SBIR/STTR grants. Metric goal: $15 million in new SBIR/STTR funding between 2005 and 2010. Anticipated cost: $150,000 per year for five years = $750,000.

5. **Establish Metro Milwaukee Sources of Seed Capital.** To address the dearth in seed funds that will enable us to recruit skilled entrepreneurs to startups, we need to establish Metro Milwaukee sources of seed capital. Possibilities should include: university funds, state funds, angels, seed funds, and industry funds. Metric goal: half of all research institution startups capitalized with at least $250,000 in seed funding from 2007 through 2011. Anticipated cost: $10 million.

6. **Develop Plans to Establish Shared Campus.** An envisioned shared campus will be required if Metro Milwaukee finds the resources to pursue the strategic initiatives listed above. Presuming the initiatives go forward, we should establish the following goals for the shared campus:
    a. Grounds identified: by mid 2006
    b. First building started: by beginning 2007
    c. First building established by 2008

The strategic initiatives outlined above amount to a cumulative anticipated cost of $165 million over the next 5 years, or $33 million per year. Costs for the shared campus have been excluded. Financing a shared campus will be made possible with growth in both research programs and the innovation economy.

However, it should be emphasized that this white paper goes beyond a rational analysis of the current situation; it is linked to an aggressive program plan. It is important that Milwaukee is restored to its former status as a giant of industry and innovation. Since its founding in the 19th century, Milwaukee has witnessed a long line of private and public entrepreneurs who have created quality government, industrial excellence and a fine place to live. Over the past 25 years, some of that has come undone. This initiative, along with others in the metro area, could help create a new culture of innovation, progress and civic excellence.

Introduction

Goals and Purpose of this White Paper

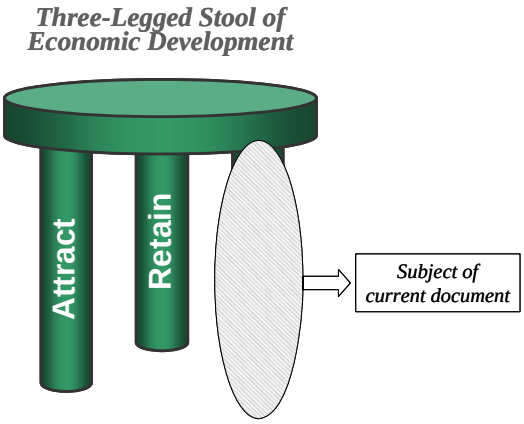
This document – known amongst its creators as "the white paper" - has been the work of a small group of concerned citizens in the Milwaukee metro area. All of the authors are involved in one way or another in the fields of economic development, technology development and commercialization, research, regional planning, finance or new enterprise development. The paper has also benefited from input by experts elsewhere in the country who have studied or participated in the building of regional innovation economies.

The goals to be served by this document are simple:

- To educate and inform a wider swath of stakeholders – including the general public – about the workings of what has been called the innovation economy, as well as to articulate the potential benefits for greater Milwaukee in incorporating an innovation economy mindset and strategy into its own future planning and actions
- To provide a benchmarking assessment of how well Metro Milwaukee is doing in terms of building a high knowledge, technology-based innovation economy
- To pose a set of action recommendations via which Metro Milwaukee could increasingly incorporate elements of the innovation economy into its economic development strategy

The current document departs from previous strategic planning efforts in two ways. First, we focus on Metro Milwaukee rather than the State of Wisconsin. The latter is well served with such efforts as the Wisconsin Technology Council, the 2020 Report, and the Governor's economic growth initiatives. However, the Metro Milwaukee area is a unique economy in itself, which requires its own strategic vision and this paper intends to address the Metro Milwaukee economy specifically.

Second, in this paper, we focus more on strengthening the economic development infrastructure to grow new, technology-based companies that will be staffed by high skill, high-wage employees, as opposed to attracting established companies from elsewhere. Nonetheless, the strategies advocated in this paper are quite compatible with supporting established companies in Milwaukee that are knowledge-based, innovative and growing high-skill, high-wage jobs. In other parts of the country, such companies have been very important as leaders in fostering university-industry cooperative research, in functioning as beta sites for new technologies being commercialized, and as being early investors in startup ventures. In addition, we believe that there is strong potential for convergent innovations in the region, where for example, the development of new medical devices may draw from new advances in biomedical science, as well as existing strengths in advanced materials and precision manufacturing. An overall economic development strategy is represented by a three-legged stool: where one leg represents strategies to retain and support established companies, one leg represents strategies to attract established companies from outside the region, and one leg represents strategies to grow new companies (see diagram).



This paper focuses primarily on the latter, although it should be understood that launching new companies often involves creative partnering between established companies and new startups, and there is great potential for this in Metro Milwaukee.

As a first step, let us describe what we mean by an "innovation economy," particularly how it differs from the durable goods manufacturing economy that has been the traditional bulwark of greater Milwaukee and indeed the entire upper Midwest.

Ingredients of the Innovation Economy

What we are calling the innovation economy has been labeled by others as the "new economy" or the "information economy." We think that those terms are somewhat confusing. For example, the notion of an information economy seems to imply that all of its elements are tied to computers, computer science and associated hardware and software. While information technologies have indeed been an important part of the developing innovation economy worldwide, they are being supplanted and supplemented by advances in areas such as materials, biotechnology, sensors, transportation, energy systems and a host of fields. In fact, one of the more interesting characteristics of the innovation economy is the "convergence" of different fields of science and technology into novel applications. The authors have also shied away from the "new economy" terminology. The new economy nomenclature has too often been tied to the agendas of particular political parties or industry interests, and it ignores the fact that many of the companies leading the charge in growing an innovation economy have been around for years. GE Medical, with a strong presence in the metro area, is an illustration. What is really new about the innovation economy is the extent to which it setting the pace for wealth creation and regional development throughout the world and accounting for an ever-larger share of US commerce.

What then are the defining characteristics of the innovation economy? Most students of the field suggest various admixtures of the following:

- The innovation economy is characterized by products and services that have origins in cutting edge research and development. Intellectual property (IP), in the form of patents, is often a key relative advantage.

- The innovation economy has close links to research institutions, particularly major universities, which are sources of both new IP as well as graduates who have advanced training in the newly emerging areas of science and technology.
- Compared to previous eras, much of the cutting edge technology in the innovation economy is developed and commercialized in smaller enterprises and startups, which seem to have more organizational and technical flexibility to exploit new technologies.
- The innovation economy relies more on new forms of capitalization including venture capital (VC), angel investors, and various forms of public-private partnerships.
- The innovation economy is national and global, and success demands the capacity to master trade in high-margin goods. Globalization, in turn, has been facilitated by advances in information systems (e.g., the internet) and transportation technologies.
- The innovation economy has raised the bar for employees' skills and educational levels, with the entry-level norm being some postsecondary coursework, certifications and/or degrees. The number of baccalaureate and graduate degrees in the workforce of the innovation economy is notable.
- The innovation economy in the US is highly regionalized, with some states and metro areas having attained national and international standing therein, and many laggards trying to catch up. Most metro areas that have succeeded in the innovation economy have involved extensive public and private partnerships, new public policy directions, major long term investments of public funds and dedicated leadership. The Research Triangle Park region in North Carolina, greater San Diego and its CONNECT program, the state of Pennsylvania with its Life Science Greenhouse initiative[1], metro Atlanta and the Georgia Research Alliance, and Silicon Valley are illustrative.
- The innovation economy is heavily reliant on key innovators – inventors, researchers, investors, and entrepreneurs – who are very much in demand and highly mobile. Those states and regions that can retain and attract such individuals will thrive; those who suffer from "brain drain" will not.

Given these generally agreed-upon understandings of what constitutes an innovation economy, how does Milwaukee measure up in 2006? This question, as well as trying to identify the key challenges that the metro area needs to address, will be the focus of the next section.

1 · With the leadership of Governors Hodges, Sanford, and Hunt, the North Carolina created a blue print for the Research Triangle, and in 1981 launched the North Carolina Biotechnology Center, a major strategic planning resource and catalyst for economic development that now receives $8 million per year in funding;
· UCSD President Richard Atkinson established UCSD Connect in 1985 and now through BIOCOM, an association of life science companies, the region continues to develop 5 year strategic development plans;
· Beginning in 1999 with the leadership of then Governor Tom Ridge, Pennsylvania committed $11.3 billion of its national tobacco settlement to health- and life science-related research and commercialization initiatives -- current Governor Mark Schweiker, continues to support this initiative saying it will help the Commonwealth become "the best place in the world to build and grow life science businesses."

Benchmarking Milwaukee on Innovation Economy Indicators

As regional economic development leaders have become more understanding of the promise and features of the innovation economy, a parallel activity has ensued which constitutes comparative or "benchmarking" analysis of nations, states, metro areas, universities and industries. The basic approach is fairly straightforward: First identify statistical indices that directly measure (or are proxies thereof) various features of the innovation economy. Second, look at an array of representative communities (or states, or universities) and see how they stack up. In some cases the indices are direct measures of outcomes, such as average number of new startup companies, patents and so on. In other cases, the indices are input variables to the innovation process (e.g., university research expenditures).

The analyses presented below include several types of indicators. It should be emphasized that these data are by no means a complete statistical picture of where Milwaukee is relative to the innovation economy. They are more suggestive than comprehensive; a complete statistical analysis would go beyond the purposes of this white paper, and encompass many more pages of text and tables.

Indicators of the Innovation Economy I: Commercialization and Finance. Metro areas are potentially well suited to commercializing technological innovations, because knowledge is generated, transmitted, and shared more efficiently in close proximity. A metro area with a top biotechnology cluster will have more innovations, and fewer will escape to other regions, or at least, they will do so at a slower rate. However, the successful commercialization of technological innovation into products that succeed in the marketplace is highly contingent on pulling together creative combinations of early stage capital to support the development process.

Joshua Rosenbloom, professor of Economics at the University of Kansas, made an assessment of several financial variables that capture this activity.[2] He studied 50 metro areas in the US and used SBIR/STTR grants, venture capital investments, and initial public offerings (IPOs) as good proxies for the financial dynamism that is seen in the innovation economy.

Parallel analyses support his choice of metrics. The sector that grows through new company startups and venture capital is a robust locus for employment growth in the US. According to the National Venture Capital Association (NVCA), venture capital backed companies employed more than 10 million American workers and generated $1.8 trillion in sales in 2003. Employment in venture backed companies jumped by 6.5 percent between 2000 and 2003, while national private sector employment shrank by 2.3 percent. In particular, strong employment gains were recorded in the heavily ventured medical sectors between 2000 and 2003.[3]

The table below summarizes his results for the 50 metro areas. As can be seen, Milwaukee fares rather poorly. This benchmarking analysis places Metro Milwaukee 48th out of 50 on the composite indicator. This should be a wake-up call. Metro Milwaukee and state economic

2 "The Geography of Innovation Commercialization in the United States during the 1990s," Joshua L. Rosenbloom, 2004. Paper still in work at: http://people.ku.edu/~jrosenbl/workingpapers/innov5.pdf
3 http://www.nvca.org/

leaders should have good reason to focus attention on this component of the innovation economy in the Metro Milwaukee region.

Index of Innovation Commercialization

MSA/CMSA	Rank	SBIR/STTR Grants per Capita	Venture Cap Funds per Capita	IPOs per Capita	Innovation Commercialization Index
San Francisco	1	36.1	100.0	100.0	100.0
Boston	2	100.0	39.3	44.2	77.7
Denver	3	62.0	28.6	40.1	55.3
San Diego	4	56.6	22.7	37.9	49.7
Austin	5	34.4	34.7	32.0	42.8
Washington DC	6	44.3	13.7	23.7	34.6
Raleigh	7	29.5	21.7	28.1	33.6
Seattle	8	23.0	16.8	28.2	28.8
Salt Lake City	9	22.0	7.5	19.6	20.8
West Palm Beach	10	2.0	8.1	38.3	20.5
Minneapolis	11	14.7	8.7	23.6	19.9
Philadelphia	12	16.3	7.5	18.9	18.1
New York	13	10.0	9.7	22.5	17.9
Los Angeles	14	18.8	7.4	15.1	17.5
Atlanta	15	10.1	10.6	20.3	17.3
Houston	16	6.1	4.9	29.3	17.1
Hartford	17	20.2	6.0	14.1	17.1
Dallasa	18	3.8	10.1	20.4	14.6
Pittsburgh	19	12.1	5.8	14.1	13.6
Nashville	20	4.8	7.3	19.0	13.1
Buffalo	21	15.7	1.8	11.4	12.2
Portland	22	8.0	8.1	11.8	11.8
Kansas City	23	3.7	3.3	19.6	11.3
Charlotte	24	3.0	4.9	17.8	10.9
Miami	25	1.7	5.3	18.1	10.6
Orlando	26	13.2	5.2	6.1	10.4
Louisville	27	5.1	2.3	16.3	10.0
Phoenix	28	8.0	4.3	11.3	10.0
Chicago	29	4.7	4.8	13.8	9.9
Columbus	30	12.2	4.2	6.5	9.7
Detroit	31	11.4	1.3	9.8	9.6
Cleveland	32	14.3	2.2	5.7	9.4
Rochester	33	7.7	5.1	9.1	9.3
St. Louis	34	5.5	6.0	10.3	9.2
Indianapolis	35	2.2	2.0	17.4	9.1
Tampa	36	2.7	2.7	15.3	8.7
Cincinnati	37	11.1	2.1	6.7	8.5
Greensboro	38	5.3	1.4	10.7	7.3
Birmingham	39	5.8	2.3	9.2	7.3
New Orleans	40	2.8	3.2	7.5	5.7
San Antonio	41	8.2	1.0	4.2	5.7
Sacramento	42	5.8	3.5	3.7	5.5
Norfolk	43	8.3	0.4	4.3	5.5
Providence	44	7.8	1.5	2.8	5.1
Oklahoma City	45	3.5	1.5	6.2	4.7
Jacksonville	46	0.0	1.8	9.1	4.6
Memphis	47	1.5	2.2	5.9	4.0
→ **Milwaukee**	48	2.4	0.8	5.9	3.8
Grand Rapids	49	1.7	0.2	6.5	3.6
Las Vegas	50	0.7	0.1	2.1	1.2

Indicators of the Innovation Economy II: Academic Research. Academic research and development has become one of the key drivers of regional economic growth. Metropolitan areas that have academic institutions performing large amounts of R&D are more likely to attract and grow technology companies, as exemplified by Boston with its linkage to MIT and Harvard,

the San Francisco Bay area that is home to Stanford and two University of California campuses, and the Research Triangle Park area of North Carolina that hosts Duke, North Carolina State and the University of North Carolina. As reported recently by the Wisconsin Technology Council, academic R&D is an integral part of the innovation economy, with contributions in the form of patents, new commercial products, skilled employees, new companies, job creation, and tax revenues.[4] The Association of American Universities concluded that there is an economic multiplier of 36 jobs per $1 million spent on academic R&D.[5]

Using available and comparable data for 2003, Metro Milwaukee had roughly $150 million in academic research expenditures. Of this, the Medical College of Wisconsin had the largest portion, at approximately $109 million, followed by UW-Milwaukee with $27 million, Marquette with $11 million, MSOE with $2.5 million, and UW-Parkside with $0.5 million.[6] Between 1998 and 2003, Metro Milwaukee research institutions have shown significant growth in research spending: MCW – 94%, UWM – 31%, Marquette – 68%, MSOE – 44%, and UWP – 200%.

There is great diversity among the individual Metro Milwaukee research institutions: a medical school, a dental school, a rich spectrum of engineering disciplines, technical colleges, clinical programs, biotech programs, three business schools, a law school, and collaborative programs with regional hospitals and state businesses. Metro Milwaukee is home to some of the most advanced basic research accomplishments, particularly in the areas of: functional MRI, systems biology, molecular genetics, bioinformatics, functional genomics and proteomics, rehabilitation engineering, therapeutics, medical diagnostics, water science, and cardio vascular science.[7]

While Milwaukee is beginning to show significant growth in academic research expenditures, it has a way to go to be nationally or even regionally competitive. Typically, larger metropolitan areas with several research institutions inside their urban boundaries lead their states in per capita R&D spending. The table below represents several metro areas in the Midwest with similar populations and their respective per capita R&D spending relative to their state levels based on comparable numbers from 2001.

Per Capital R&D Spending for Selected Metro Areas Compared to State Levels

MSA (Metro Statistic Area)	MSA Population	MSA Institutions	MSA 2001 R&D Dollars	MSA Per Capita R&D	State Per Capita R&D	Delta	Delta %
Pittsburgh	2,400,000	3	$496,000,000	$207	$136	$71	52%
St. Louis	2,700,000	4	$450,000,000	$167	$120	$47	39%
Minneapolis	3,000,000	5	$465,000,000	$155	$93	$62	67%
Cincinnati	2,000,000	3	$207,000,000	$104	$87	$17	19%
Cleveland	2,100,000	4	$212,000,000	$101	$87	$14	16%
Metro Milwaukee	1,500,000	4	$117,000,000	$78	$132	($54)	-41%

As can be seen, Milwaukee ranks at the bottom of this comparison group of cities on both a measure of academic per capita, as well as a measure of the extent to which the metro area

[4] The Economic Value of Research and Development in Wisconsin, September 2004, by the Wisconsin Technology Council.
[5] www.bea.gov/regional/rims/brfdesc.cfm
[6] http://www.nsf.gov/statistics/nsf05320/tables.htm
[7] A recent, more comprehensive report of areas of excellence in Metro Milwaukee academic R&D has been developed by Bill Hendee at the Medical College of Wisconsin; whendee@mcw.edu.

dominates the state R&D figures. In Wisconsin, most academic research is still concentrated in Madison. In other states, major metro areas have a greater concentration of academic research and a leg up on competing successfully in the innovation economy. For example, Pittsburgh is the home to Carnegie-Mellon University and the University of Pittsburgh. Minneapolis is the location of the main campus of the University of Minnesota. Looking nationally, metro San Diego is the home of the University of California at San Diego and San Diego State University, which account jointly for over $700 million in research.

There is one other area in which Metro Milwaukee research institutions have made significant progress. They are active collaborators with one another and increasingly with industry. There are numerous joint research and education programs and many research faculty members that are shared between institutions. Such programs include the Functional Imaging and Biomedical Engineering Programs shared between MCW and MU; the Medical Informatics programs between MCW, MU, UWP and MSOE; and the Medical Informatics Program between MCW and UWM. The institutions also collaborate via TechStar, a technology transfer and business venturing organization.

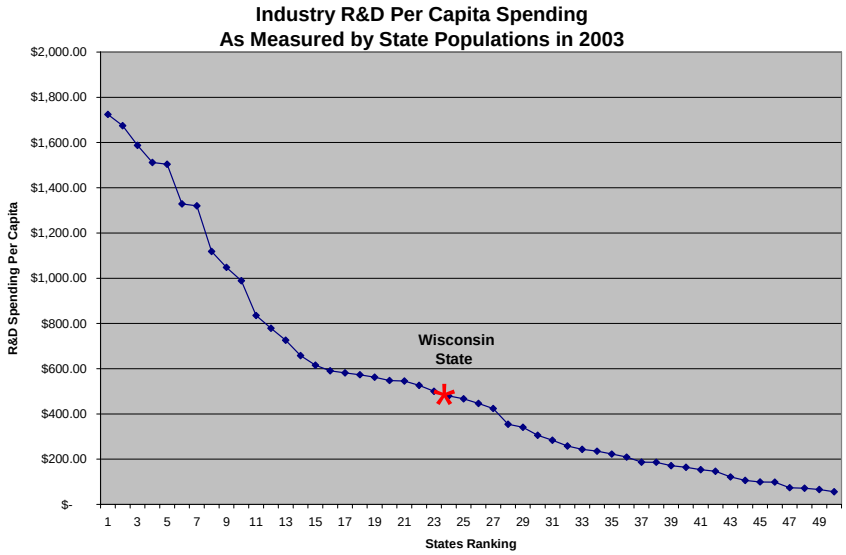
In Metro Milwaukee, MCW is a clear early leader in academic R&D, but MCW's spending levels are far short of the level needed to bring Metro Milwaukee to comparable metro areas. To achieve more competitive levels of academic R&D spending in the city of Milwaukee, and to give a breadth and depth in unique areas that support both MCW and a developing metro economy, R&D spending levels at UWM should be above $100 million per year – roughly triple current levels. Given the importance of academic R&D in the tech-led economic development continuum, improving R&D talent and spending levels should be a clear imperative for Metropolitan Milwaukee and the state of Wisconsin.

There are limiting factors that should be addressed in growing Metro Milwaukee's academic R&D. For example, while student count among the Metro Milwaukee universities is almost identical to UW-Madison, there is a much greater emphasis on research-focused graduate training at Madison. Moreover, the academic research in Metro Milwaukee is parsed among five schools with very different missions, histories and research traditions (or the lack thereof). While there are islands of specialized research talent in each school, there are relatively few conduits to engage one another in inter-institutional research projects and major initiatives.

There are also significant historical disparities between Madison and Milwaukee in the allocation of state financial resources to support the development of interdisciplinary R&D infrastructure in each region. Additionally, within the UW System, there are wide disparities in the distribution of operating funds. Though both Madison and Milwaukee schools are research oriented, operating funds for Madison are $28,659 per student, but for Milwaukee funds are $17,719.[8] If Milwaukee were allocated the same per student operating funds as Madison, operating funds to Milwaukee would be increased by over $114 million per year. Alternatively, and perhaps more realistically, if UWM could "enrich" its support formula via incentives for increases in research and graduate training, the support and performance gap could perhaps be closed more rapidly.

[8] http://www.legis.state.wi.us/lab/reports/04-10full.pdf

Indicators of the Innovation Economy III: Industrial Research. While the importance of academic research cannot be overemphasized, by itself the research university cannot drive a robust technology sector. No metro area or state has yet succeeded in being competitive in the innovation economy without having a strong base of industry research, and several have failed. For example, the Research Triangle Park area of North Carolina did not really take off until IBM and several biomedical companies established themselves in the region. Moreover, the presence of those companies had a twofold impact: it not only provided hundreds of high-paying, high skill jobs, but also functioned as a seed bed for entrepreneurial ventures and startup companies. In contrast, states such as Louisiana, despite hosting institutions such as Tulane and LSU have experienced great difficulty in building an innovation economy in what has historically been a low wage, low tech industrial base, except for the oil industry in the Gulf.



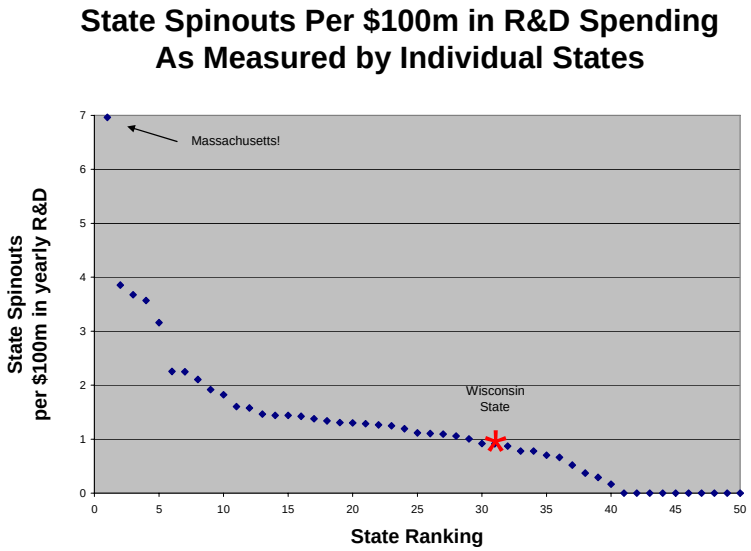
The picture for Wisconsin and Milwaukee is somewhat mixed on this score. At a state level, Wisconsin ranks near the national median (24th) in terms of industrial research per capita, and a good fraction of this is accounted for by companies in the Metro Milwaukee area. Milwaukee is home to numerous health, technology and service companies that conduct their own proprietary R&D and collaborate with research universities.

GE Medical, the largest biomedical products employer in Metro Milwaukee, is building a large information technology facility next to MCW. Unfortunately, GE's biomedical research facilities are located in Connecticut. Furthermore, because of the size of the company, GE typically makes strategic acquisitions of larger, more well-established biomedical companies, rather than dedicating resources to engaging startups. With headquarters in Milwaukee, GE Medical has a steady need for trained graduates in biomedical fields. One of the most promising opportunities with GE is in designing academic and research programs to prepare university graduates for employment.

Indicators of the Innovation Economy IV: Startup Activity. An important characteristic of innovation economies, state or regional, is the rate at which new technology-based companies are formed. Typically, these startup companies are either spinouts of university research or

existing technology companies. Startups have the ability to be flexible and act quickly in bringing to market cutting edge technologies. Startups tend to stay "at home" early in their growth cycle, thus anchoring jobs and economic activity in a region or metro area.

States and metro areas can be compared or benchmarked relative to their peers on the basis of spinouts per research dollar from their academic research institutions. The data points on the graph below represent each state in the US on the basis of spinouts per $100 million in academic R&D spending.[9] The state of Wisconsin demonstrates only mediocre metrics for converting research into spinouts that contribute to regional innovation commercialization.



In contrast to Wisconsin as a whole, the spinout metrics of the research institutions in Metro Milwaukee are 4.3 spinouts per $100 million and the city of Milwaukee's metrics are 5.1 spinouts per $100 million.[10] In Metro Milwaukee several research institutions have established "technology transfer" programs that make it a priority to spinout new technology companies to the local economy. In the last few years, Metro Milwaukee research institutions licensed technologies into 15 local start-up companies.[11] This is an emerging metro strength that the region can clearly leverage in the future.

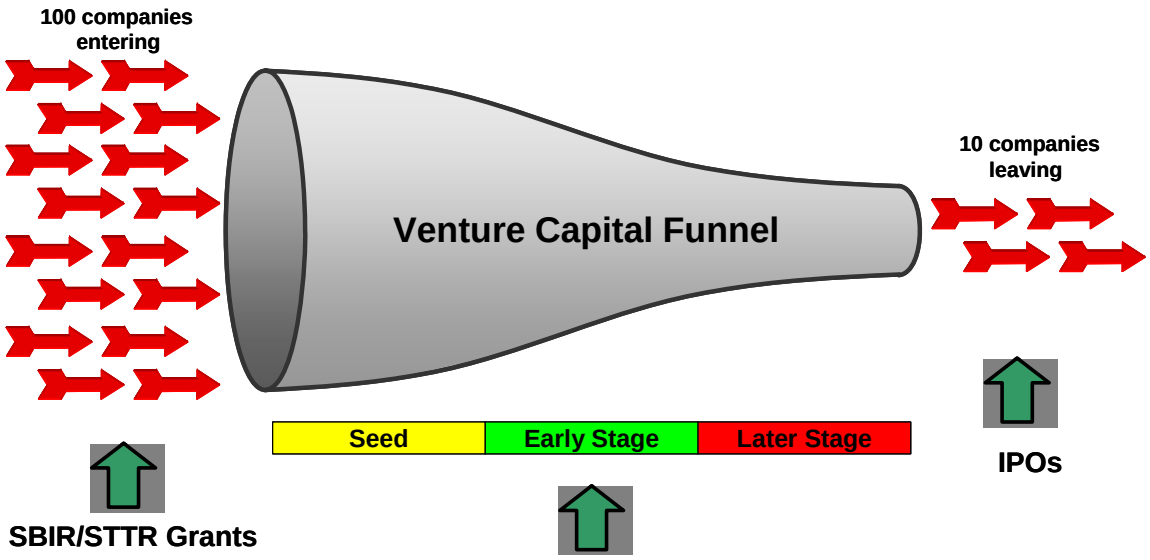
As an indicator of what is possible in spinout metrics, consider MIT: with $485 million in annual research spending, they spin out roughly 150 companies per year, or roughly 31 spinouts per $100 million in research. In 2003, MIT started 17 companies that were capitalized with at least $500,000 of external funding, down from their average of 22 per year.

What Does Metro Milwaukee Need?

[9] http://drc.cfed.org/measures/univ_spin.html
[10] Remember: this metric is a ratio – Metro Milwaukee is skilled in the numerator, but deficient in the denominator.
[11] MCW – Medical Advances, PointOne, Prodesse, PhysioGenix, ArgiNOx, Cytometix, Bioinnovation, Neurognostics, OncoDetect; UW Milwaukee – NovaScan, PackageScan, Intelligent Maintenance Systems, JunTech; Marquette – Parident Therapeutics; MSOE – 3D Molecular Designs.

These data are both sobering and informative. They suggest that Metro Milwaukee has the potential to be a force in the new innovation economy, but has many challenges to overcome. At this point, it is useful to review Joshua Rosenbloom's Innovation Commercialization Index, which is based on three simple variables: SBIR/STTR grant awards, venture capital investment, and initial public offerings (IPOs). We can integrate these three variables and present the concept of a healthy innovation economy in the deal flow pipeline diagram, below.

Deal Flow Pipeline for Innovation



Moving through a funnel are companies, represented by arrows. The funnel itself represents our venture capital investment activity – in the front part of the funnel are seed investments, and then early- and later-stage investments at the narrowing end of the funnel. Typically, only those companies that make it through the funnel would qualify for an IPO. The funnel representation of venture capital makes sense because not all companies that begin with seed investments will satisfy the criteria for later stage venture investment. Hence, to get just a few companies that move all the way through the funnel, we need many more companies entering the front end. As can be seen from the diagram, the three metrics relating to the innovation commercialization index are directly related to the number of companies entering and flowing through this pipeline.

From the diagram, we conclude that any plan to move Metro Milwaukee up in the innovation commercialization index requires us to build a pipeline of ideas – that turn into innovations – that can be converted into companies – that are fundable with venture capital investment to market products to national and international markets. In Metro Milwaukee, the easiest place to influence and increase this kind of deal flow is at the front end, or at earliest stages of the venture capital funnel.

A strategy to influence and increase deal flow requires us to assess and develop the earliest stages of the startup infrastructure, from idea generation, research and development, through company formation activities, the capabilities of the entrepreneurial community, and the availability of seed and early stage capital. This leads us to the following interim conclusions:

1. **University research is an idea generator for innovation.** Policymakers from many metro areas are rethinking the role of universities and technology transfer in building regional economies.[12] Knowledge and new technology are driving the innovation commercialization and university research is giving birth to new products and companies. We have well-established foundations in our research institutions. Supporting the growth of our research institutions in Metro Milwaukee is a top priority for our innovation economy efforts.
2. **Inter-institutional collaboration offers great potential.** There are five diverse academic institutions in Metro Milwaukee that actively engage in research. Together, they cover a broad spectrum of expertise and research specialties. Inter-institutional and interdisciplinary collaborations are some of the best foundations for idea generation and innovation. The five institutions are public and private, their specialties, missions, charters, the strength of their research, the commitment to economic development all differ. Though all collaborate willingly, consensus decisions take more time, and speaking with a unified voice is not always possible.
3. **Tech transfer to startups.** An essential element of an innovation economy is deal flow. Research institutions can serve as engines of idea generation. But research spending and numbers of patents across metro research institutions are not sufficient. Continuing development of tech transfer programs that facilitate the translation of intellectual property to regional startups is critical.
4. **Capital for seed-stage companies.** Capital for seed-stage companies is critical for establishing a healthy deal-flow pipeline. The entire state of Wisconsin is anemic in seed funding. SBIR grants take time. Angels are picky. Our local venture capitalists have shown limited activity at seed stage. To effectively address Metro Milwaukee's seed sector of the economy, we need to develop more capital at the seed stage in Metro Milwaukee.
5. **Growth requires a long-term vision and commitment.** There will be no quick fixes in developing the innovation commercialization infrastructure for Metro Milwaukee. Stanford's tech transfer program is 30 years old; it took them 15 years to break even. We will need a long-term vision and commitment to push this initiative over the many obstacles that will be encountered.
6. **Milwaukee's innovation economy is just getting started.**[13] Milwaukee doesn't have a long-history of technology transfer and seed stage venture capital. We don't have the success stories and the community of researchers, entrepreneurs, and investors who have done it before. That means we start from scratch, boot strap, take risks, and blaze new trails. It also means that we can learn from the hard-won lessons of other communities and regions.
7. **Growth doesn't occur without public investment.** The State of Wisconsin and State University System are unaccustomed to thinking about Milwaukee as a center for research and innovation. Growing the research base in Metro Milwaukee will require significant financial support over the long-term from these constituencies. In making this

12 "Accelerating Economic Development Through University Technology Transfer." 2005, http://www.innovationassoc.com/docs/CT_NatRpt.pdf

13 Actually, as presented in John Gurda's book "The Making of Milwaukee," Milwaukee past has inspiring stories about corporate venturing in the manufacturing sector where successful spinouts from established companies were common.

commitment, it is important that government agencies and taxpayers look at these expenditures as an investment rather than sunk costs. Wisely managed, they will produce a more robust metro economy, with high skill, high wage jobs for Wisconsin residents.

8. **Entrepreneurs.** In some metro areas, there is an established population of entrepreneurial business leaders that pull innovations into businesses at very early stages. Business leaders with a track record make a big difference in attracting institutional venture capital investments. Wisconsin and Metro Milwaukee do not have significant populations of entrepreneurs who have successfully cycled through the startup process.
9. **Cultural Practices.** Community and institutional cultures are an essential ingredient in developing an innovation economy. Public and institutional policies, which provide acknowledgment, incentives and promotion for people who participate in the entrepreneurial process, can change the culture. These cultural practices need to be renewed in Metro Milwaukee, and focused on the biomedical technologies.

Programmatic Accomplishments to Date

Over the past few years, despite limited available resources and modest attention from the media, significant groundwork has been laid to foster an innovation economy in Metro Milwaukee. Some of the intellectual framework for those efforts was established when in November 2000, regional leaders from Metro Milwaukee drafted a visionary whitepaper addressing the needs of the knowledge-based economy for the first Wisconsin Economic Summit.[14] With identification of key clusters and illumination of critical success factors, this document served as a roadmap for the development of the innovation economy in Wisconsin, with particular attention to Metro Milwaukee. Many of the ideas in this document were subsequently expressed in new or expanded programs and activities. In this section of the white paper, we will briefly describe those accomplishments,

A Capsule Overview of Initiatives

Among the list of substantive and programmatic accomplishments in fostering an innovation economy in Metro Milwaukee since November 2000 are the following:

- **Academic Research:** MCW became one of the fastest growing research institutions and received an endowment of $300 million, the new Chancellor of UWM - Carlos Santiago - made it an institutional goal to triple the amount of sponsored research in ten years. Growth targets were also developed at UWM and other research institutions in the metro area are willingly engaged in economic development initiatives.
- **Academic Collaboration.** The Biomedical Technology Alliance (BTA) Collaborative Grant Program was launched to facilitate growth in collaborative academic research in the Metro Milwaukee area. (The BTA will be discussed in more detail below.)
- **Technology Transfer:** TechStar and CATI were created to facilitate commercialization opportunities among research institutions, the Medical College of Wisconsin Research Foundation (MCWRF) was expanded, WiSys began serving UWM, and a precedent for transferring intellectual property to local startups was established
- **Industry Collaboration:** eInnovate was created to network entrepreneurial IT professionals, and another programmatic thrust of the Biomedical Technology Alliance (BTA) was set up to facilitate collaborations within biomedical research and development.
- **Entrepreneurship and Startups:** The State launched the Wisconsin Entrepreneurs Network (WEN), and the Governor's business plan competition was established. TechStar and CATI facilitated the launch of 17 startup companies in the Milwaukee area, including Prodesse, Physiogenix, and Neurognostics. Over $20 million in grants and seed funding was raised for these companies
- **SBIR/STTR Grants:** The Regional Economic Partners funded a SBIR/STTR grant specialist, approximately $11 million in grants were awarded to early stage companies in the Metro Milwaukee region between 2000 and 2005.

[14] See "Critical Success Factors for Knowledge-Based Industrial Clusters in Wisconsin," by Mark Mone, John Torinus, Brenda Blanchard, Timothy Sheehy, and Joseph Shepley, November 2000.

- **Angel Funding:** Silicon Pastures and the Golden Angel investment groups were created; the State launched the Wisconsin Angel Network and created tax credits for angel investments in Wisconsin startups (SB 255).
- **Facilities:** The Cozzens-Cudahy Center was developed to accommodate translational research from UWM, the Milwaukee County Research Park was updated with new wet lab space to accommodate the relocation of ZyStor from St. Louis, and MCW has a new $130 million biomedical research building under construction.

Clearly, the November 2000 whitepaper served its purpose. Though the sentiment is still contemporary, we have run the ball down field and the chains need to be moved. In this paper, we benefit from the lessons learned over the last five years and we confront the challenges of the next five. We also integrate the higher level strategic perspective with tactical plans to bring the community together in a common vision for setting goals and implementing them. In the balance of this section of the paper we will provide more detailed information on two accomplishments that will be important in further advancing an innovation economy in greater Milwaukee:

- Biomedical technology as a key focus
- The establishment of the Biomedical Technology Alliance (BTA)

Defining an Area of Innovation Economy Strength: Biomedical Technology

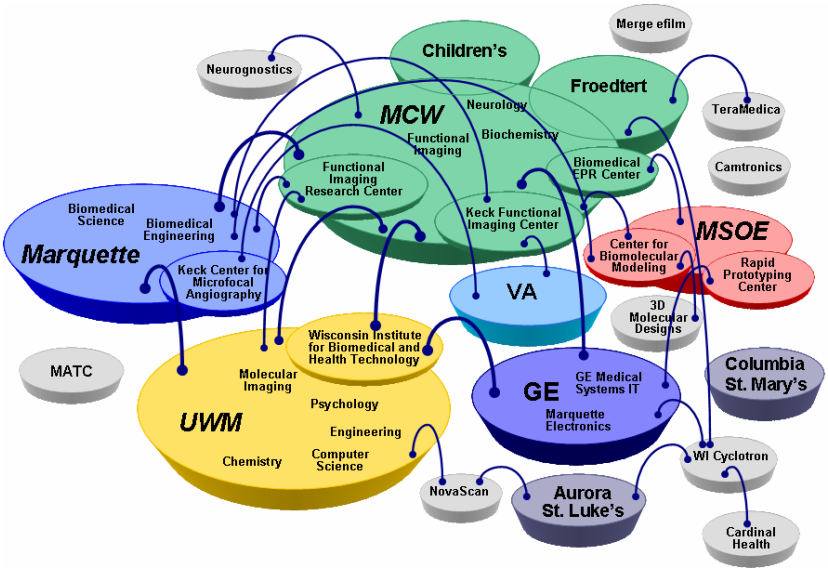
Looking elsewhere in the US at success stories in building regional innovation economies, virtually every case involves the early and disciplined identification of an area or areas of technology concentration. For virtually all successful metro areas this usually means one or a small handful of emphases. For example, San Diego has focused on information technologies and biomedical, as has the Research Triangle Park metro region in North Carolina.

After considerable study and deliberation the authors of this report have concluded that the field of biomedical technology is the most prominent, widely distributed, and successful cluster around which to build an innovation economy in Metro Milwaukee. The Medical College of Wisconsin and GE Medical are leaders in national research and industry in the biomedical fields. As far as analysts can see, health care will be a growing industry developing with introductions of new technologies, startup companies, and investment capital. Biomedical technology should be the focus of our economic development efforts for Metro Milwaukee as it will provide the biggest impact for our economic development efforts. The rationale and cornerstones for Milwaukee's strengths in this area include the following:

- *Academic Research.* Academic research in Metro Milwaukee should exceed $200 million annually within the next few years, with the majority of that concentrated in biomedical areas, particularly in MCW. With a more focused effort, and some program innovations (discussed below), the growth rate could be even accelerated.

- *Clinical Populations.* Another critical element of biomedical research in the Milwaukee region is the clinical population. Involvement of practicing clinicians, and large and diverse patient populations, are essential to the development of new technologies to ensure that they address real clinical needs (the "clinical pull"). There is also a significant opportunity to involve public health organizations in the region more closely with the biomedical technology development process to help identify patients appropriate for clinical trials. A clinical trials consortium aimed at giving researcher access to relevant clinical populations would be a significant advantage to researchers in the area.

Biomedical Imaging Collaborations

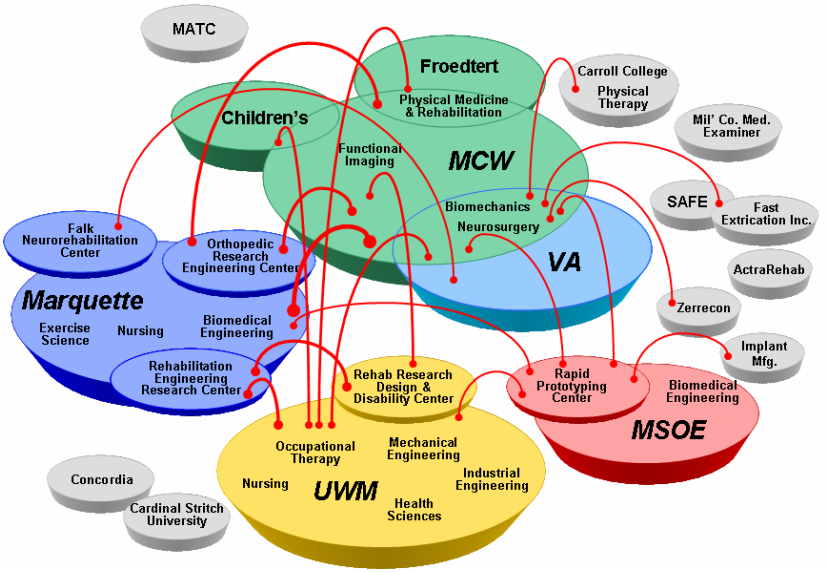


- *Biomedical Imaging.* Biomedical imaging, an important and growing field, has extensive roots in the metro area. This field spans a range of technologies that

includes MRI, CT, PET, nuclear medicine, molecular imaging and functional MRI (fMRI). The health issues addressed by research in biomedical imaging include: Alzheimer's, Parkinson's, ADHD, Multiple Sclerosis, pain management, Cancer, Cardiopulmonary, Renal, Osteoporosis, and Addiction. GE Medical Systems is already a major industry player in this area, and there are opportunities for research-based collaborations with metro area academic institutions.

Illustratively, functional imaging is an important area of strength with two centers dedicated to functional imaging – the Functional Imaging Research Center (FIRC) and the Keck Functional Imaging Center. Other research centers involved in biomedical imaging include the Keck Center for Microfocal Angiography at Marquette and the newly formed Wisconsin Institute for Biomedical Health Technology. These centers are draw on core departmental strengths at Marquette, MCW and UWM that include biomedical engineering, biochemistry, engineering and computer science.

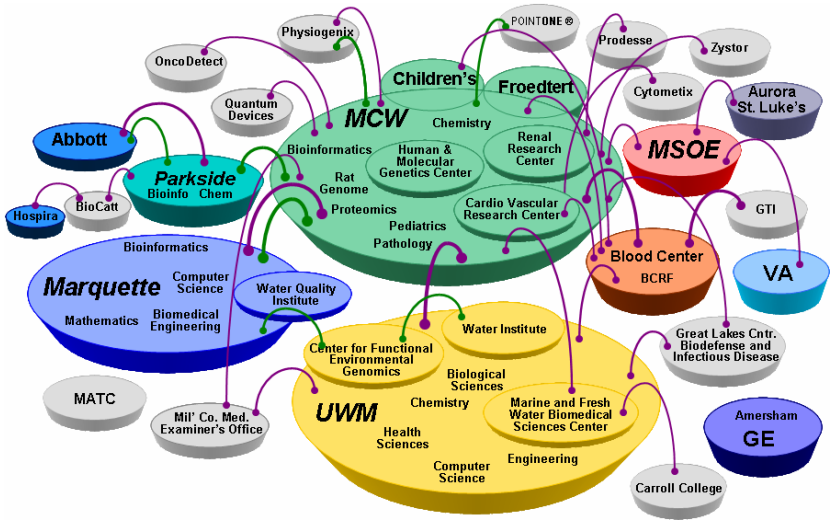
Rehabilitation and Biomechanics Collaborations



- *Rehabilitation and Biomechanics.* Rehabilitation and biomechanics addresses the body's muscular, skeletal and neurological systems. Health issues addressed by researchers working in this area include: stroke, spinal injury, aging, access and assistive technology, spasticity, amputee rehabilitation, walking and gait analysis, neurorehabilitation, cerebral palsy and ALS.

  The Milwaukee-area Veterans Adminsitration facility and Froedtert Hospital represent

Genetics, Proteomics and Biochemistry Collaborations



important clinical sites for research in rehabilitation and biomechanics. MCW's resources in this area include the Physical Medicine and Rehabilitation Department located at Froedtert and biomechanics and neurosurgery capabilities centered at the VA. At Marquette, the Biomedical Engineering department and three rehab-related centers – the Orthopedic Research Engineering Center (OREC), the Rehabilitation Engineering Research Center (RERC) and the Falk Neurorehabilitation Center – are the basis for significant collaborative research. UW-Milwaukee's resources include the Rehabilitation Research and Design Center (R2D2) as well as departmental strengths in Nursing, Occupational Therapy, Health Sciences, and Mechanical and Industrial Engineering. The Rapid Prototyping Center (RPC) at MSOE is an important resource that is used in a variety of collaborations.

Medical Informatics. Medical informatics involves the merging of information technologies – hardware and software – into the delivery and management of patient care. Emphases in medical informatics include: diagnostics via expert systems and neural network software, electronic medical records, and sensors and associated software for patient monitoring and diagnostics. It is an area of growing importance to the health care system nationally and a growing resource in the Milwaukee region. Education and training are important as well as research , and are a strength of the regional academic institutions in the area of medical informatics. There are a growing number of small companies working in the area as well as large companies such as GE Medical Systems that are commercializing products in this area.

Genetics and Proteomics. Resources in genetics, proteomics and bioinformatics play an important role in the Milwaukee region's capabilities in drug discovery. There is an opportunity to more closely link these resources with biochemistry research in the area and public health for a unified drug discovery and assessment capability. Key areas addressed by research in genetics, proteomics and bioinformatics include: drug discovery, animal Models, rat genome and personalized medicine.

While we focus significant efforts towards the area of biomedical technologies in this paper, we acknowledge that other knowledge-based clusters in Metro Milwaukee also have innovation commercialization potential. Those include: information technologies, financial services, visual display technologies, advanced manufacturing technologies, energy and environmental technologies. As these clusters develop, we may also develop specific infrastructure and programs to support them.

Establishment of the Biomedical Technology Alliance (BTA)

In this paper, we introduce the Biomedical Technology Alliance or BTA. The BTA was formed in 2004 to address the challenges of growing an interdisciplinary, collaborative research environment in Metro Milwaukee. An important observation of successful innovation economies, is that the most commercializable innovations result from interdisciplinary collaborations among talented researchers, who are in turn linked to hard-charging companies in that field. Academic R&D is an important contributor to the economic development continuum in metro areas. The BTA will serve as a framework for surveying our assets, tracking established collaborations, developing new research collaborations, establishing entrepreneurial forums, commercializing innovations, increasing research capacities in metro area universities and planning for a new campus for collaboration and development of biomedical technology.

A significant portion of the biomedical technology research and development done in the region is done collaboratively – between institutions and with industry. Regional strengths include public health, biomedical informatics, rehabilitation, biomechanics, biomedical imaging, cardio-pulmonary, genetics, proteomics and biochemistry. These strengths are used to address a wide range of health issues.

What is the BTA? The Biomedical Technology Alliance (BTA) is an organization that was formed to build collaborative bridges that increase academic research capacity in Southeastern Wisconsin and throughout the IQ corridor. Through partnership with the State of Wisconsin and the federal government and with the support of academic, community, business and government leaders, the BTA is taking important steps toward the goal of **increasing collaborative research in the Milwaukee Region**.

Regional and State Benefits: Fostering research collaboration will have significant benefits for the Milwaukee region and the State of Wisconsin. For instance, UW Madison collaborates with academic institutions from around the world. A stronger research enterprise in Metro Milwaukee will provide a strong incentive for more collaboration with UW Madison from within the State. For that reason, the BTA is complementary, not competitive to similar initiatives in Madison and will serve as an important pillar of the IQ corridor in Milwaukee. The benefits include:

- **A stronger economy in the Milwaukee Region.** The potential impact of greater collaboration fostered by the BTA could be in the hundreds of millions of dollars. Research helps to strengthen and diversify the economy of the Milwaukee region. According to a recent report by the Wisconsin Technology Council, 36 high-paying jobs are created for every $1 million in R&D spending, and academic institutions in the region already account for over $100 million in annual research funding. Economic impact projections for a similar program between Mayo Clinic and the University of Minnesota, which received a 5-year $70 million state commitment, shows a $290 million in overall new impact annually to the state of Minnesota by 2010.
- **More and better jobs and higher wages.** Data from other States shows that the economic activity generated by the collaboration could result in as many as 4,000 net new direct and indirect jobs. Moreover, these jobs are likely to pay more, involve “knowledge workers”

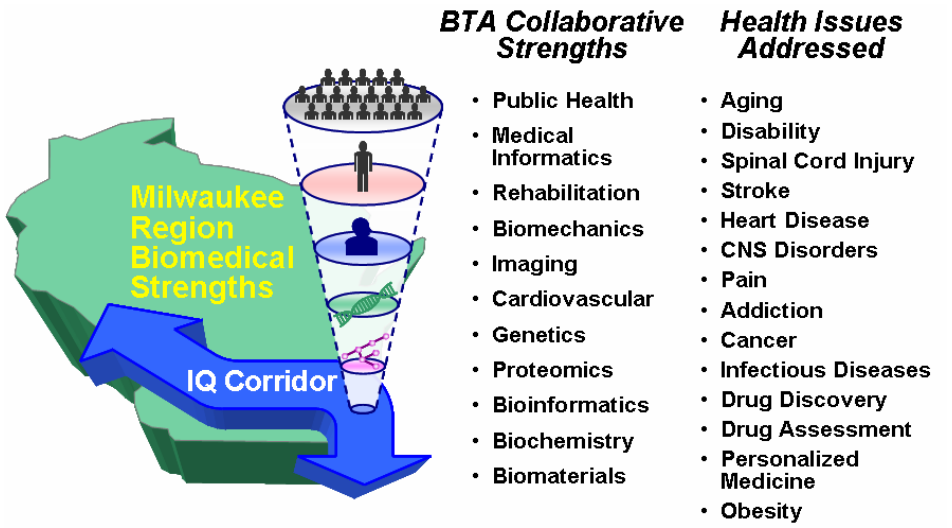
with more extensive education and training, and be less vulnerable to the whims of global outsourcing that has severely impacted the manufacturing economy of the region.

- **Broader tax base.** Wisconsinites enjoy the level of service they receive from the government; however, the costs of those services have exceeded the means to pay for them. Growing Southeastern Wisconsin is the only way to share the burden of the taxes to pay for the service we all come to know and expect.
- **Keeping our best and brightest at home – stop the brain drain.** Wisconsin has a first class system of higher education. Unfortunately, too often our most talented young people leave the state to take innovation economy jobs where they are more plentiful. We must foster an economy that provides opportunities for talented people, as well as a culture that rewards risk-taking and encourages entrepreneurship, especially when it comes to new high-tech business start-ups. The BTA seeks to foster the kinds of businesses that ultimately provide the high paying jobs which are desperately needed to keep our best and brightest people working in Wisconsin.
- **Leveraging federal grants.** The BTA will help researchers gain access to federal research funds, bringing new money to the region. More and more, the National Institute of Health and other federal funding programs are supporting interdisciplinary and inter-institutional research teams, because those teams have proven more effective in producing valuable scientific results and innovations. BTA's collaborative programs will make researchers more competitive for federal grants, and seed money for promising areas will help provide preliminary data that is critical for winning major federal research funds.
- **Increasing companies' access to academic research.** While it is an established fact that many new and successful innovation economy products and businesses have links to university research, it is also an established fact that universities are often difficult to engage and a puzzle to many business leaders. The BTA will help companies innovate and succeed in the global market place by connecting both existing and new companies to research being conducted in Wisconsin research universities. BTA functions as a neutral broker of R&D partnership, with an eye toward assisting successful biomedical companies that in turn will also help to fund future research innovations in the region.
- **Spin-off more companies.** Academic R&D spending and researchers are the key catalysts for starting new technology companies. The Milwaukee region has already shown its ability to spin out companies is among the best in the nation based on spin out companies per research dollar.

How is the BTA organized? The BTA established a steering committee to guide the initial efforts of the alliance. The steering committee is made up of academic, government, business and community leaders, and is co-chaired by Dr. William Hendee, President of the MCW Research Foundation and Cory Nettles, attorney with Quarles and Brady, LLP, and former Secretary of Commerce for the State of Wisconsin. The steering committee includes two subcommittees: the finance subcommittee, chaired by Tom Hefty; and the scientific subcommittee chaired by William Hendee.

The BTA was founded in 2004 by academic research institutions in the Milwaukee region – Marquette University, Medical College of Wisconsin, Milwaukee School of Engineering, UW-Milwaukee and UW-Parkside – along with the TechStar Foundation. It received its start when TechStar (a Milwaukee-based collaboration among the founding institutions that emphasizes research commercialization) received federal support of $300,000 to begin organizing the alliance. These monies are likely to take the BTA through its initial planning and program development stage through the year 2006, but will not be sufficient to support planned program operations. The TechStar foundation board, consisting of representatives from each of the founding academic institutions, oversaw these initial efforts that included a series of collaborative seminars highlighting the region's biomedical strengths.

Academic Participation. The academic institutions in the Milwaukee Region are the founding members of the Biomedical Technology Alliance. These institutions include Marquette University, Medical College of Wisconsin, Milwaukee School of Engineering, University of Wisconsin-Milwaukee and University of Wisconsin-Parkside. These institutions are the core of much of the collaborative research done regionally. In many cases, research centers at the institutions act as the collaborative bridges that bring together the resources of multiple institutions to address specific health issues.



Industry Collaborations. In addition to the academic institutions, industry plays a critical role in biomedical research in the Milwaukee region. In many cases, research is done collaboratively with academic institutions. Local industries also represent a significant opportunity for greater collaboration. Increasing the awareness of the research capabilities that exist in the academic institutions can lead to greater collaborations between industry and academia.

Strategic Plan: The BTA seeks to foster research collaboration by creating awareness, incentives and infrastructure. The long-term vision for development includes funds to seed early collaborative research and the establishment of a new campus of shared facilities.

- **Awareness.** The BTA has been organizing a series of collaborative conferences that highlight the Milwaukee region's significant strengths in biomedical technology. These events have drawn together clinicians, researchers and business people as well as government and community leaders, and have grown to include over 200 participants. The programs have included Wisconsin Governor Jim Doyle, Milwaukee Mayor Tom Barrett, as well as leaders of the founding academic institutions.

- **Incentives.** Modeled on the successes of other states such as Minnesota, the BTA is seeking to provide incentives that will push researchers to build collaborative teams that reach across academic institutions and include industry. The State of Wisconsin recently committed $500,000 in matching funds that will be used to foster this sort of collaborative research that includes multiple institutions. There is a bill currently in the legislature to expand the matching funds by $2 million. This program, called the BTA Collaborative Grant Program is discussed in the next section.

- **Infrastructure.** The BTA is also working to provide infrastructure that allows researchers to work collaboratively. In the near term, the academic institutions have been creating inter-institutional agreements to make it easier to assemble collaborative teams. The BTA also supports initiatives such as a community institutional review board (IRB) that could streamline the process of gaining approval to perform clinical trials at the various clinical sites in the region. In the longer term, the BTA seeks to pursue several larger and more comprehensive initiatives that will help build an innovation economy in the region. These include a new biomedical campus where researchers from multiple institutions can share facilities and equipment, a program of endowed chairs to dramatically increase the research capacities of metro-area universities, and the promotion of startups in early stage funding to support technology commercialization. These efforts are discussed in more detail below.

New Initiatives and Future Visions

Previously, the authors tried to accomplish three objectives: (1) introduce and discuss the concept of a regional innovation economy and how it might benefit Metro Milwaukee; (2) examine Milwaukee's assets and shortcomings in becoming an innovation economy leader; and (3) present accomplishments to date in organizing and fielding various program initiatives aligned with an innovation economy vision.

In this section, we describe new proposed program initiatives that are significant in scope and vision. Taken together, if all of these efforts were launched over the next five to ten years, there is no doubt that the regional economy would be transformed. There is much that can be learned from the successes – and mistakes – of other regions as Metro Milwaukee goes forward. This section has been crafted to benefit from "best practices." [15]

All of the proposed initiatives in this section could be linked and/or managed through the auspices of the Biomedical Technology Alliance. Over the previous two years the BTA has proven to be a worthy organizational vehicle for visioning and planning, as well as for program operations and management.

The following strategic initiatives are presented below:

- BTA Collaborative Grant Program
- BTA Academic Chairs Program
- Developing Technology Transfer Programs
- Developing Seed Stage Funding Sources
- A Collaborative Campus

For each of the initiatives the presentation will cover the following:

- Need and rationale
- Vision
- Operations and organization
- Costs and funding
- Implementation schedule

[15] For example: Tornatzky,LG., Waugaman, P. G. and Gray D.O., *Innovation U: New University Roles in a Knowledge Economy*. Research Triangle Park, NC: Southern Growth Policies Board, 2002,

BTA Collaborative Grant Program

Need and Rationale. More and more, NIH and other federal funding programs are supporting interdisciplinary and inter-institutional research teams, since those teams are proving to be better in producing the kind of scientific results that lead to innovations that serve society. However, researchers must first establish proven interdisciplinary teams and have preliminary data that demonstrate the merit of their proposals to access federal funds. The BTA collaborative grant program will assist collaborative research teams in getting started, enabling them to write winning grants from federal sources, and ultimately develop successful commercial products.

Vision. The mission of the BTA collaborative grant program is to build collaborative relationships that increase academic research capacity in Metro Milwaukee and throughout the IQ corridor. We envision the region becoming national leaders in interdisciplinary research involving multiple collaborative research institutions and established companies. We envision developing a research culture that is a leader in directing the innovations of research into start-ups.

Operations and Organization. Initial funds will be used to fund collaborative applied research proposals – originated by researchers from Metro Milwaukee research institutions – that have potential to develop into promising products or services that could eventually be transferred into the commercial sector. Proposals will need to include investigators from at least two Metro Milwaukee research institutions. Project proposals will not be accepted from any companies or for-profit businesses. However, there will be a preference in the awards selection process for those projects that the private sector invests in or partners with to enhance their usefulness.

Proposals will be *reviewed and selected* by a joint committee of 12 individuals as agreed to by the academic institutions, representing scientists from the participating research institutions and outside industry professionals, including venture capitalists, corporate leaders, state agency representatives, entrepreneurs, or technology experts.

Qualification Criteria. Proposals will be reviewed and selected by a committee of 12 scientists and outside industry professionals. Project proposals must satisfy the following criteria:

1. Projects must be led by investigators from Metro Milwaukee research institutions, representing two or more institutions
2. A single institution may receive no more than 75% of the funds for any given project
3. Projects must be within the broad field of biomedical research
4. Projects must have a commitment of matching funds from the researcher's originating research institutions (see discussion of matching funds, below)
5. Funds will not be awarded to any individuals outside of the Metro Milwaukee research institutions or for-profit businesses

Selection Criteria. Project proposals will be judged and selected by the project selection committee on the following criteria:

1. Assessment of scientific merit and credibility of collaborative team
2. Ability to achieve key results in defined period of time

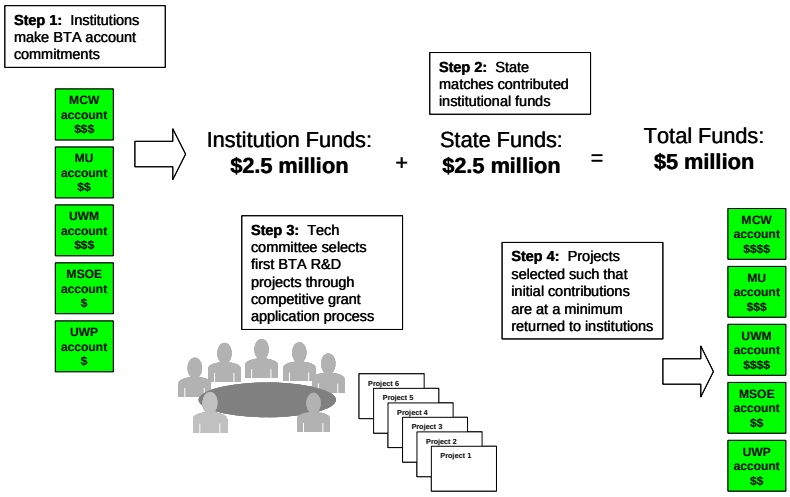
3. Projects that are budgeted appropriately and are cost effective
4. Ability to attract either additional funds or matching funds from the commercial collaborators or other sources
5. Results or milestones that would enable the collaborators to compete for follow-on grants from federal sources
6. Outcomes that could to lead to innovative commercial products or services
7. Potential intellectual and economic value the project brings to biomedical cluster in Metro Milwaukee

The *size of grants* for individual projects (as represented by researchers from multiple institutions) would be between $25,000 and $250,000. Although it is envisioned that there would be a range of projects in various stages that would be funded, it would be left to the selection committee to select those projects that best grow the collaborative research infrastructure of Metro Milwaukee. The selection committee is only obliged to fund those projects deemed exceptional. Project proposal solicitation will occur semi-annually. Payments will be made on reaching pre-agreed project milestones. Funding of projects will occur so long as funds are available.

It is expected that an important outgrowth of the BTA Collaborative Grant Program will be research findings and associated intellectual property (e.g., patents) that will be commercialized. The preferred route for commercialization will be to license new technology to a new or existing company, preferably in the metro area, as soon as practical. However, new technology often requires additional investments in applied research and development before it has sufficient value to be an attractive license. For example, a new therapeutic agent might require preclinical testing (testing in an animal model of disease) or toxicological evaluation before it could be commercialized. The National Institutes of Health and foundations do not regularly fund this type of developmental work. Therefore, to prevent promising, but unproven, technology from languishing or never being commercially developed, the BTA collaborative grant program may apply some portion of the total funds in later grant cycles to this purpose. These development funds will not be used in lieu of outside investment of the technology, but only in instances where outside investment is premature.

Costs, Funding and Fiscal Management. In the first period of operation of the collaborative grant program, the State of Wisconsin will commit $2.5 million, and these funds will be matched by funds from the academic institutions of Metro Milwaukee, creating a total initiation fund of $5 million. The rules for matching funds from the research institutions shall be modeled after the rules for matching funds used by the National Institutes of Health (NIH). The academic institutions will cover any and all administrative costs associated with this initial operating phase of the BTA collaborative grant program.

Finance and Organization of the BTA Collaborative Grant Program



Projects will include individual budgets for direct project costs for the individual participating academic institutions. Indirect costs (e.g. facilities operations and administrative costs) of research of 20% are permitted. Incidental expenses (e.g., costs of the external review) will be recovered by the participating academic institutions. Project funding for direct capital costs will not be covered.

In terms of *matching funds*, no research institution is obliged to provide matching funds until a project is selected for funding that involves a faculty member from that institution. When a project is selected for funding, each institution is only obliged to match the portion of the cost of that project that is allocated to that institution. Once projects are selected, all funds (i.e., from the State and matching funds from the universities) will be accounted for based on procedures outlined by the NIH. The rules for matching funds must also meet the allowability and documentation requirements established by NIH. One potential exception to these rules is federal funds could be used as matching funds if the origin and purpose of those funds is fully described and deemed appropriate for matching by the selection committee.

Implementation Schedule. The rollout of the BTA collaborative grant program requires promotion among biomedical researchers in the Metro area and the establishment of a grant section committee. The basic infrastructure of the BTA collaborative grant program was established in the Fall of 2005 with project proposal solicitations beginning in February 2006.

BTA Academic Chairs Program

Need and Rationale. In order to accomplish the vision of a robust innovation economy in Metro Milwaukee, the scope of academic research should be double to triple where it is today within ten years, or between $300 and $450 million per year. Particular focus should be given to UWM, where we can best leverage state resources. Within ten years, UWM's research should be above $100 million per year. While strategically we will use the collaborative framework of the BTA to grow research where it is strongest - in the field of biomedical technologies - there is also a need and an opportunity to insure that these ambitious goals are met via *tactical investment in people.* In effect, we can "leap frog" the normal growth in academic research by key academic appointments.

One little known fact of academic life is that a large percentage of important, funded research is done by a small fraction of faculty member. Some have estimated the ratio as high as 90 to 10, with upwards of 90% of key work being lead by 10% or less of the faculty. The important point is that key faculty appointments can be accelerated by targeted, generous funding programs.

The proposed program will adapt many of the lessons of the Georgia Research Alliance.[16] Since the early 1990s, via an innovative partnership between state government, industry and the research universities of Georgia, over 40 endowed "Alliance" professorial chairs have been established, mostly in the Atlanta area. Virtually all of those have been in disciplines and technological areas that are deemed to be critical for continuing to build a technology-based economy in Georgia. The incumbents are typically very senior individuals who have distinguished themselves nationally in the quality and scope of their basic research. Importantly, a second criterion is the extent to which candidates have also distinguished themselves in creative industry partnerships and in the commercialization of technologies deriving from their research. Many have started companies in the past, or have spent parts of their careers in blue ribbon industrial labs. In order to reinforce these criteria, search committees tend to involve industry experts as well as academics.

Endowed chairs tend to rapidly accelerate the scope and excellence at their institutions. These individuals tend to become "walking franchises", bring in millions of research dollars, taking a leadership role in their departments or units, and being a force in the commercialization of technology. By promoting their efforts and successes, they also tend to be role models for other faculty members, particularly junior faculty, and contribute to changing the culture of the institution.

Vision. Within a decade the authors can visualize a cohort of upwards of 20 BTA Endowed Chairs in place in metro-Milwaukee research institutions. Collectively, these individuals would be bringing in $25-50 million in sponsored research funding, as well as being actively involved in technology commercialization, graduate training, and entrepreneurial ventures.

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[16] Tornatzky, L.G. "Technology-based economic development in Atlanta and Georgia: The role of university partnerships." *Industry and Higher Education,* February, 19-26, 2002.

Operations and Organization. Several tasks would need to be addressed to make this vision a reality, both in planning and in execution:

Identifying Target Domains. While this whitepaper has identified biomedical technology and research as the substantive focus of building an innovation economy, to go about a recruitment process for endowed chairs this would need to be sharpened into target specialties. This would involve some more detailed analysis of the regional biomedical economy, looking at national trends and forecasts in the field, and mapping with emerging strengths in regional institution. Eventually a rank-ordered "menu" of potential chairs would be developed.

Developing a Funding Strategy. The practice in other regions has been to fund such chairs via a mix of institutional monies (e.g., through Development offices), state appropriations and industry support. The percentage mix of these sources is highly negotiable, and would need to be developed within the Wisconsin context.

Costing Chairs. Endowed chairs involve a semi-permanent endowment, with the annual salary and related expenses for an incumbent coming out of investment income from the endowment corpus. Theoretically, a well-managed endowment can go on indefinitely. However, the annual costs for an endowed chair can vary quite widely, given choices on non-salary expenses, such as startup costs, laboratory expenses, research assistants, and the like. This will all involve significant discussion.

Recruitment and Selection. Assuming that multiple endowed chairs will be created, a highly visible national recruiting approach needs to be developed. Ideally, this should all be managed locally, to reduce overhead costs paid to headhunters. Recruitment as well as selection processes should be conducted to insure that candidates are not traditional academic, devoid of industrial experience or interest. Recruitment and selection criteria will need to be developed and widely disseminated, and careful attention given to who will sit on review committees and/or manage the recruitment process.

Ongoing Management. Ideally, BTA Endowed Chairs, once hired, would not sink into a department or center and become invisible. Better, they would be actively involved with other endowed chairs and faculty members in helping to realize the goals of the BTA program. Some ongoing effort and staffing needs to be dedicated to fostering cooperation and involvement in various BTA initiatives. There is likely to be some turnover of Chair incumbents, and some management structure needs to be in place to insure continuity with the vision of the program.

Costs, Funding and Fiscal Management. Each endowed chair funded by this proposed program would involve a one-time investment of $3 to $5 million. Startup and ongoing management costs of an endowed chair program would be significantly less, but in the range of $250-$500K annually, which would be spread across the entire program.

Implementation Schedule. The major time-eaters in launching such a program would be involved in planning, scoping and getting agreements on funding. If those could be accomplished within 2006, the actual execution of the program could move out fairly rapidly. An initial cohort of BTA Chairs could be in place for the start of the Fall semester 2007.

Development of Technology Transfer Programs

Need and Rationale. Technology transfer programs at both MCW and UWM are in a state of active evolution and growth. Over the last five years, with the development of the MCW Research Foundation, one senses a perceptibly positive change in the community of researchers at MCW towards startup activities. The successes in startup activities are generating more interest from others to the same. At UWM, WiSys has been active in patenting innovative research. Startup activities at UWM are still in the formative stages, due in part to UWM's smaller research program and more established teaching culture. Tech Transfer programs at the other research institutions are less developed, again, commensurate with the size of their research programs.

Both tech transfer programs at MCW and UWM are under governance pressure to generate near-term cash revenues. In some cases, the pressure to generate near-term cash with a license competes with startup activities. For example, if IP can be licensed to an established out-of-state company for $25k or more, it generally will be, rather than licensing the same IP to a startup for equity. The consequence of licensing IP to established companies out-of-state is continuing development of that IP is then limited and the economic development value of licensing IP to established companies out of the region is negligible.

On the other hand, a commitment from research institutions to push IP to startups, if possible, should be a focal point of a Metro Milwaukee economic development strategy. There are important benefits for researchers, institutions, and the local community in the establishing an institutional culture and capability to push academic research to startups, as summarized in the table below. With startups, technology development continues in the community through research grants, SBIR and STTR grants and equity investment. Startups create wealth in the community through equity appreciation. Startups provide supplemental wages for investigators and employment opportunities for graduates. Nearly 84 percent of university-linked start-ups set up shop in the state and/or community in which the university is located. Investment capital flows into the region, and new high skill, high paid jobs are created. Industry partnerships and investment in startups are more common. Successes beget more activity and an entrepreneurial culture grows around the research institutions and community.

While involving more specialized expertise and effort than straight licensing deals with established companies, commercializing new technologies via startups has the potential for much greater benefits to all involved: the community, the researchers, and the university. These are summarized below.

Benefits of Startups to Researchers, Institutions, and Community

Economic Development Benefits	Startup	Licensing
License royalties	yes	yes
Founders equity	yes	no
SBIR research grants	yes	no
Equity investment dollars	yes	no
Supplemental wages for investigators	yes	no
Employment for grads	yes	no
Control in development	yes	no
Feedback in development	yes	no
Follow-on development	yes	no
Assurance to develop	yes	no
Local economic development	yes	no

The ability to push IP to startups at a research institution is heavily dependent on institutional leadership, an entrepreneurial culture and champions. Much of what TechStar has accomplished at MCW is a direct result of the advocacy of Bill Hendee. Chancellor Carlos Santiago brings new leadership to UWM, and we anticipate creative developments in the technology transfer program there. Institutional leaders can have a big impact on culture. Institutions that are successful in tech transfer provide rewards and incentives for faculty who participate in commercialization activities. This might involve such things as giving faculty credit toward tenure if they file a patent application, or providing relief from teaching obligations to make more time for supporting startups. Other incentives involve publicizing faculty successes through articles in newspapers, department or university award ceremonies, and similar recognition. Technology transfer and economic development should find its way into the mission statements and public speeches.

An institutional technology transfer program that establishes the capability to form companies is not intended to compete with angel investors or venture capitalists. In fact, it is just the opposite. This capability is intended to be complementary to the seed investor requirements of seeing validated technologies, clear business plans, an early management and technical team, first customers, and a founding corporate structure that is compatible with seed funding requirements.

What is needed across the technology transfer functions of the metro area institutions are continued funding of personnel assets to address issues of culture and rewards, and the incorporation of best practices in tech transfer via start-ups.

Vision. A five year initiative is proposed that will continue a more entrepreneurial approach to university technology transfer. It will include the following program components:

- Adding staff with *experiential* background in starting companies to institutional tech transfer programs. This would include new dedicated staff at UWM and MCW. The vision is to increase the university startups metric to 8 startups for every $100 million in research in Metro Milwaukee through 2011.
- Creating an entrepreneurial culture, that is both bottoms-up and top-down, and is active within the participating institutions, as well as in the larger community. The former will include a re-thinking of reward systems and policies, and the latter a series of events and

forums for leadership from tech transfer offices, entrepreneur companies, venture capitalists, law firms, and industry professionals network.

- Maintaining an SBIR/STTR grant coach that is well-versed in both science and business, who can facilitate the maintenance of a pipeline of SBIR/STTR grant applications and increase the funding of SBIR/STTR grants for Metro Milwaukee, with a goal of $15 million in new funding by 2011.

Operations and Organization. While this initiative would be community-wide in impact, its primary beneficiaries and the focus of most activities would be area universities. The technology transfer staff should be closely aligned with the institutions where they are assigned.

Costs, Funding and Fiscal Management. Six professional level positions are needed to staff and manage this initiative, at an annual cost approximating $800K. The initiative would need to be funded by a combination of university cost-sharing, community fund-raising, appropriations and revenue.

Implementation Schedule. Contingent upon funding, this initiative could be operational by January 2007.

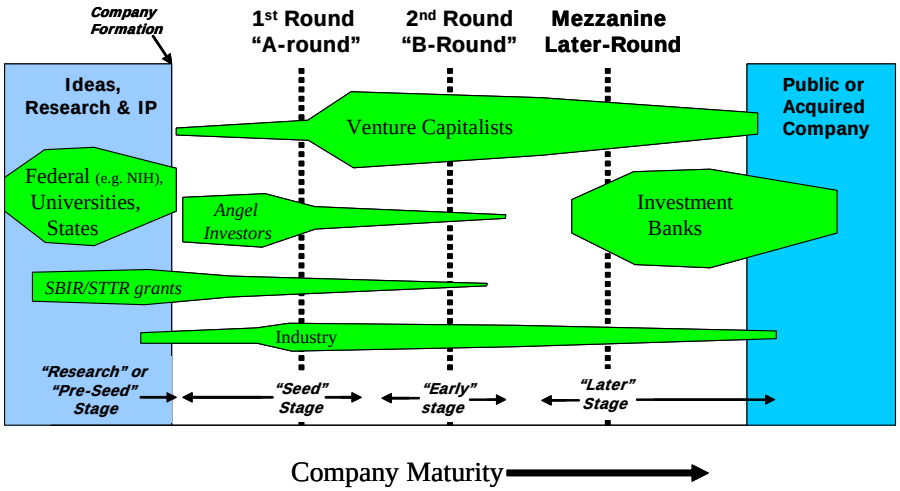
Establishing Metro Milwaukee Sources of Seed Capital

Need and Rationale. The State of Wisconsin is plagued with a dearth of venture capital investment, despite the fact that four institutional venture capital firms that have offices in the state. According to the goals published in 2020 Report, Wisconsin should move from $111 million venture capital investment in 2000, to $300 million in 2010, and $500 million in 2020. Ironically, the amount of venture capital investment in Wisconsin has steadily decreased since 2000 to just over $57 million in 2004, and what is looking like a much smaller amount invested in 2005.[17]

Funds for companies with innovations are dispersed by different entities or organizations at different stages. Typically, an innovative company must succeed through one stage to get to the next. These stages along with the funding sources are illustrated below:

Company Funding Sources by Maturity Stage

*Shapes illustrate funding activity at specified stage of maturity



Need for Seed Stage Capital. In a healthy innovation economy, successful companies grow to maturity by accessing the appropriate funding sources at each successive stage of maturity. In Wisconsin, although our research institutions are exemplary in gaining access to academic research funding sources, our funding sources beyond the research stage are not well established. As a result, many promising companies are not formed, and those that are formed are not transitioning easily from research through seed stage. This is the beginning of the deal flow continuum – the stage where ideas become innovations and innovations become companies. In this stage, the first employees of the company are hired – in particular, a leading entrepreneur.

Seed stage capital sources are generally located close to the opportunities they invest in. Solving the deal flow issue in Metro Milwaukee requires us to establish new sources of seed stage capital, in Metro Milwaukee.

[17] http://www.ventureeconomics.com/vec/stats/2005q2/state_WI.html

To fill the seed capital gap in Pennsylvania, the state seeded three private, seed-stage funds to meet the needs of startups associated with the Life Science Greenhouses. More than $100 million was invested from its state pension fund. In Indiana, the Indiana Future Fund was capitalized with $75 million from multiple investors including the state pension fund. This fund-of-funds is privately managed and is aimed at seed- and early-stage biotech companies in the state.

Other states have leveraged investments from private sources. New York, for example, created a separate state agency – New York office of Science, Technology and Academic Research – to provide seed funding for research programs that will drive economic development. This investment has lead to multi-billion investments in both industry funded academic research and high tech manufacturing. The New York office of Science, Technology and Academic Research provided seed stage funding for Centers of Excellence at academic institutions from across the State.

Exemplary universities not only have linkages to private seed and venture capital funds, but many also establish their own seed-stage funds for university researchers. Purdue's Office of Technology Commercialization offers two investment vehicles for inventions originating at the University. Purdue's Trask Innovation Fund provides faculty with "gap funding" to validate proof-of-concept, and the Trask Pre-Seed Venture Fund invests in start-ups that are commercializing Purdue-licensed technology. Georgia Tech's VentureLab provides seed capital and through their Fellows program, matches funded faculty members with successful entrepreneurs who assist them in developing commercialization and investment strategies. At a recent NASVF conference, it was noted that there are now over 80 university-oriented seed funds.

Vision. Metro Milwaukee should have sufficient sources of seed stage capital such that half of all research institution startups are capitalized with at least $250,000 in seed funding. Anticipating growth in annual research spending, along with a metric goal of 8 spinouts for every $100 million in research, we would expect 90 spinouts in the period of 2007 to 2011. Capitalizing half of those with $250,000 would require an additional $10 million in seed funds to be invested in Metro Milwaukee.

To achieve this goal, Metro Milwaukee needs to establish local sources. Governor Doyle's focus on developing angel networks and tax incentives for angel investment is to be applauded. It is not clear that more can be done with the angels. Other possibilities include the following:

- *Venture Capital Funds.* Our state institutional venture capital funds are early-stage, but not typically seed stage. What are the best ways to engage the state VCs to invest in seed?
- *University Sources.* There are a variety of possibilities with university oriented funds:
  - *Translational funds.* Institutions can designate a portion of available research funds for translational research.
  - *Industry programs.* Institutions can develop specific programs, such as UWM's WIBHT Initiative, that involves industry in research programs.

        - *Seed Funds*. Universities can establish seed funds using an institutional venture capital or other models.
    - *BTA Collaborative Grant Program.* The CGP encourages translational research. It does not currently fund companies. The program could be expanded to be able to provide seed funds to university-based spinouts. This type of fund could be administered by the same, or a similar committee that selects projects for research funding.
    - *New Seed Fund.* A $5 to $10 million seed stage fund that makes many smaller seed investments within a given community would be much more effective in stimulating the deal-flow pipeline than a $75 million fund that makes very selective larger investments on a national scale. Such a fund could be raised by new general partners in a traditional venture capital structure or it could be established as a community managed ever-green fund.

Some may argue that seeds funds for university spinouts should only come when the market is capable of attracting them. However, the availability of seed funds also creates a market for startups. If the research community understands that one of the ways to continue research and realize its benefits is through commercial ventures, it will change the culture in our research institutions and create incentives to produce high quality startups. Clearly, not all these startups will succeed, but out of 90 startups over the next five years, a good percentage of them will.

Operations and Organization. TBD

Costs, Funding and Fiscal Management. TBD

Implementation Schedule. Operational by 2007.

Collaborative Campus

Need and Rationale. As the various initiatives of the BTA become operational, two results are inevitable: a dramatic growth in the scope of collaborative research and development, and unfortunately, a huge need for expanded laboratory and technology commercialization facilities. The table below is a tool for estimating the capacity utilization of Metro Milwaukee's existing research and incubation facilities. There are several existing facilities that will are able to provide space for research and development activities for several years to come, including: the Cozzens-Cudahy Center, CATI, the Milwaukee County Research Park, and MCW's new biomedical building. However, research institutions, particularly UWM, and research spinouts will require new operational facilities in Metro Milwaukee by 2009. This is an opportunity for Metro Milwaukee to capitalize on evolving collaborative environment in biomedical technology and establish a new campus of shared infrastructure would facilitate new research collaborations and create an identity and anchor for the IQ corridor through Milwaukee. This shared campus is part of a long-term vision that would also serve an important role in stimulating new economic development for Metro Milwaukee.

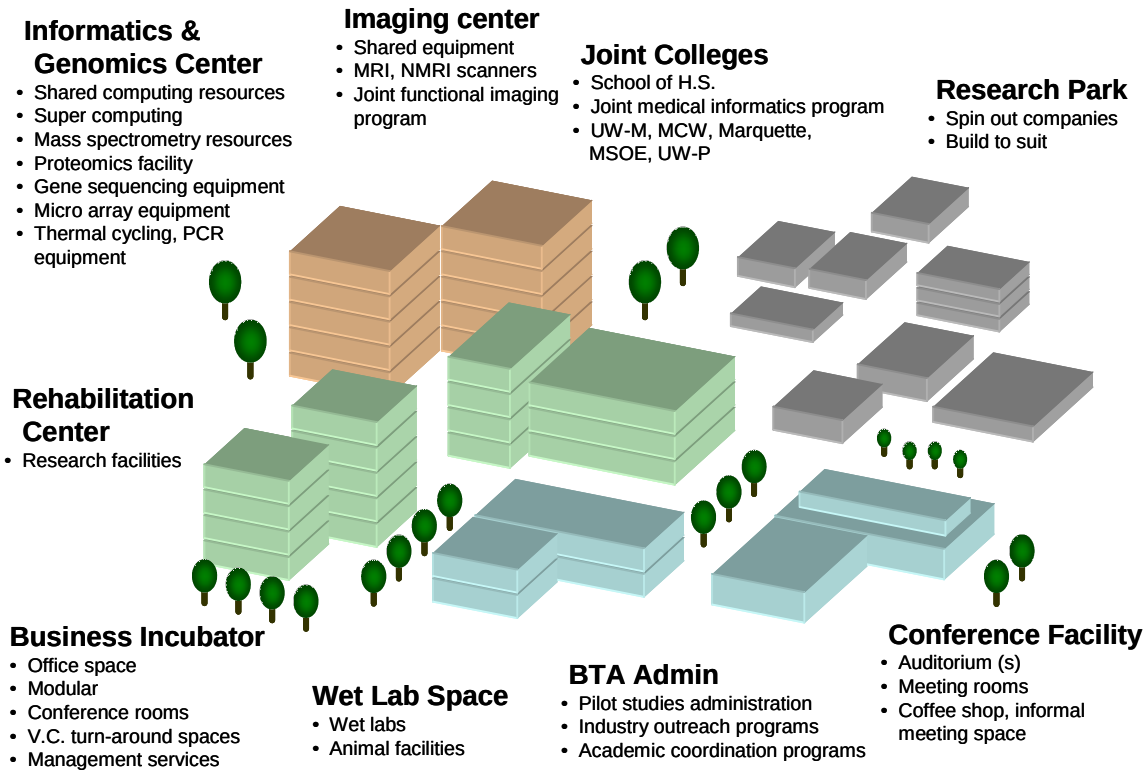
Metro Milwaukee

Research, Development, Incubation, and Commercialization Facilities Estimates

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Research spending ($ millions)	$150	$175	$200	$225	$250	$275	$300	$325	$350	$375	$400
Total number of research FTEs (1 per $100k)	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,250	3,500	3,750	4,000
Research startups (4 per $100M in research)	6	7	8	9	10	11	12	13	14	15	16
Startup located in incubators (50%)	3	4	4	5	5	6	6	7	7	8	8
Yearly startup FTEs (3 per startup)	9	11	12	14	15	17	18	20	21	23	24
Summed FTEs (assuming 50% growth per yr)	9	24	48	86	143	231	365	567	872	1,330	2,019
Total growth in research and startup FTEs	9	274	548	836	1,143	1,481	1,865	2,317	2,872	3,580	4,519
Total sq ft of facilities rqd (250 sq ft/person)	2,250	68,500	137,000	208,875	285,813	370,344	466,266	579,273	717,910	894,990	1,129,735
Available (sq ft)	165,000	165,000	165,000	165,000	165,000	165,000	165,000	165,000	165,000	165,000	165,000
Deficit (sq ft)	0	0	0	43,875	120,813	205,344	301,266	414,273	552,910	729,990	964,735

Estimated Available Expansion Capacity (sq ft):	
Cudahy Center	10,000
CATI	5,000
Milwaukee County Research Park	30,000
MCW Biomedical Building	120,000
Total:	165,000

Vision. A campus of shared infrastructure would include collaborative research labs in fields such as imaging and rehabilitation, genomics/informatics, and a business incubator with wet lab space, and a conference facility. All shared infrastructure would be located centrally in Metro Milwaukee on lands with expansion space available for joint colleges and a research park. The facilities would be managed by a consortium of research universities, or potentially by one lead university. The diagram below illustrates how the BTA infrastructure will look in eight to ten years with continued support. To a great extent, the physical layout and design will emulate features of other collaboration-oriented research parks elsewhere in the US. Of those, the Centennial Campus of North Carolina State University is a good model, with office and laboratory buildings that have both academic and industry tenants, and where there are "spaces" designed to encourage interaction and inter-organizational bridging.



Operations and Organization. The BTA campus location has yet to be established. The requirements for the site location include: a Metro Milwaukee location, 60 acres or more, freeway and parking access and development incentives. Prospective sites include:

- The Veterans Medical Center grounds next to Miller stadium in Milwaukee
- The Park East or Pabst City grounds in downtown Milwaukee
- Land across from MCW on Watertown Plank Road (contiguous to the Milwaukee County Research Park)

Land acquisition will be funded through a combination of the transfer or long-term lease of federal or local lands, and federal and local tax incentive programs

This first BTA building will be constructed as a modular and adaptable space that is consistent with the needs of collaborating biomedical researchers. It will serve as an open conference and meeting place for academic institutions and businesses. The initial tenants will come from the academic research institutions in SE Wisconsin. This facility will also be available for lease by companies in the biomedical industry. The intent is to develop a collaborative environment between biomedical technology researchers and business professionals. The business professionals may come from either early stage companies or established businesses, such as GE Medical. A facility of this type would not only help ensure that early stage biomedical companies have the resources necessary to get started but also aid in bringing in new biomedical businesses from outside the area.

The first BTA building will contain a biomedical incubator space (20,000 ASF), a conference and meeting space (8,000 ASF), and laboratories for collaborative biomedical research (28,000 ASF). The total size of the building will be approximately 56,000 ASF/88,000 GSF.

	ASF	GSF	Efficiency
Research Labs	28,000	46,667	60%
Incubator Wet labs	20,000	31,333	64%
Conference and Meeting Areas	8,000	10,000	80%
Total:	56,000	88,000	64%

Costs, Funding and Fiscal Management. As described above, the cost of the first building will be approximately $32,000,000. Included in the cost will be an unfinished basement that can be adapted to hold larger biomedical equipment. As other components of the overall campus are articulated, more comprehensive cost estimates will become available. The cost of the overall campus will easily be in range of $100 to $250 million, depending upon design options. As such, the funding structure will need to be collaborative and creative, most likely involving a mix of state government, city and county government, and private development. Various examples of how to approach this challenge can be garnered from the experience of metro Atlanta, Research Triangle Park, and other venues.

Implementation Schedule. The overall campus development timeline will show a phased approach for the build-out of infrastructure and programs. The BTA is currently planning and investigating funding options. From a needs perspective, it is appropriate to begin development of the first building in 2007. Subsequent buildings will be established later.

Next Steps

There are three seemingly simple - but actually fraught with difficulty – steps that need to be taken in order to make the visions and strategies described in the document become reality. They include:

1. Mounting a metro-wide discussion and vetting of the arguments and proposals in this white paper. This needs both extensive and careful involvement of key "stakeholder" and a disciplined process to manage it. This would include small meetings, town hall type events, brainstorming sessions, prioritizing of alternatives, and many other approaches to gaining consensus.

   Deliverable. A revised white paper, and more importantly agreement on an action agenda of projects and activities to be pursued over the next 5-10 years. Attaining this deliverable assumes that the heat of the discussion doesn't incinerate the ideas of the white paper.

2. Identify and empower a core team of metro leaders that has the responsibility to provide ongoing oversight, work the local and state politics, and pull together the combination of state, industry and university funds necessary to launch the action agenda.

   Deliverable. An organizational structure and funding commitments to execute the action agenda.

3. Implement, implement, implement.

   Deliverable. A biomedical-based innovation economy in Metro Milwaukee that is robust, growing and transformative by 2016.

Accomplishing the objectives and deliverables of this white paper will also be extraordinarily important from a cultural and historical perspective. Since the early 19th century, when Milwaukee was founded and flourished, its story is one of risk-takers, entrepreneurs and civic leaders who have carved out a piece of the future. There are a large number of Milwaukee ghosts out there – Solomon Juneau, Morgan Martin, Mathilde Anneke, Alexander Mitchell, Eber Brock Ward, John Blankinton, Frederick Pabst, Edward Allis, Patrick Cudahy, Henry Harnischfeger, Victor Berger, Daniel Hoan, William Davidson, William Harley and Harry and Peg Bradley – whose memories need to be honored in what happens next. They accomplished great commercial or civic goals, and more often than not saw them supplanted by the next great thing. That is the nature of an entrepreneurial culture. Try something new in order to make something better, and let the chips fall where they may. And that spirit of entrepreneurialism has indeed been a characteristic of the region's past[18].

The last three decades have been difficult for Milwaukee, as well as for many of its sister cities in the industrial Midwest. However, this initiative can be part of the road back to national and

[18] Gurda, John. *The Making of Milwaukee.* Milwaukee, WI: Milwaukee County Historical Society, 1999.

global prominence for Metro Milwaukee. Just as fur, wheat, steel, shipping, beer and machine tools have defined previous entrepreneurial eras, biomedical technologies and other leading lights of a new innovation economy will define the next several decades. Metro Milwaukee needs to move boldly into that future. It needs to reward risk taking, shrug off temporary setbacks, make investments today for a larger vision, summon its courage to do the right thing, and keep its collective eye on the prize of a productive, creative and entrepreneurial future. Its citizens – young and old, established and just starting out – deserve no less.