The 2nd Annual Assessment of Technology Transfer at Michigan Public Universities

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EXECUTIVE SUMMARY

This is the second annual state report that benchmarks the technology transfer performance of Michigan's major research universities [The University of Michigan (UM), Michigan State University (MSU), Wayne State University (WSU) and Michigan Technological University (MTU)] to the national average and the best-in-class universities. The report uses statistics from the Association of University Technology Managers (AUTM) report for 2000 (most current data available). This year's report indicates that Michigan university performance again tracks or closely approaches the national average on statistics that most closely define economic development measures, except for start-up activity related metrics. The good news is that start-up activity metrics for 2000 showed improvement over 1999. Specifically the four combined universities generated nine start-up companies in 2000 compared to four in 1999.

BACKGROUND

The Michigan Economic Development Corporation (MEDC) formed the Partnership for Economic Progress with the Presidents Council, State Universities of Michigan to promote initiatives that boost entrepreneurial activity and technology transfer. The first university benchmarking report was published in 2001 to identify current levels of achievement by Michigan universities towards these goals, and was based on the AUTM 1999 report. This report also indicated that Michigan universities tracked or closely approached the national average on statistics that most closely define economic development measures, except for start-up activity related metrics. However, Michigan universities fell short of the best-in-class national universities. The best-in-class universities were identified as having the highest rank in both licenses and options yielding license income and license income received. The best-in-class universities are University of California, Columbia University, Stanford University, Massachusetts Institute of Technology, University of Wisconsin and University of Washington. Reviewing the best-in-class university activities resulted in the identification of four areas that, if further developed, could promote economic growth in Michigan. These are: superior researchers and students, commercialization activity, entrepreneurial support and entrepreneurial infrastructure. An action plan for fiscal year 2002 was developed to address these with the specific goal of improving weaknesses and promoting economic development.

THE
2ND ANNUAL
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OF
TECHNOLOGY
TRANSFER
AT MICHIGAN
PUBLIC
UNIVERSITIES

AUTM 2000

This assessment looked at the 2000 AUTM statistics for UM, MSU, WSU and MTU and benchmarked them against the national average and the best-in-class universities. It indicates that Michigan universities track or closely approach the national average on statistics that most closely define economic development measures, except for start-up activity related metrics. The 2000 data indicates that Michigan universities showed improvement, or at least stayed close to the 1999 data values. The good news is that start-up activity metrics for 2000 showed improvement over 1999. Specifically, the four combined universities generated nine start-up companies in 2000 compared to four in 1999. As the Michigan universities improved from 1999 to 2000 so did the national average. This can be seen in Table 2. In most metrics, when comparing the performance from 1999 to 2000 the Michigan average improved at the national average rate or better. However, the adjusted gross license income received showed a decline relative to the national average. This was a result of the national average improving by 64% while the Michigan average only improved by 9%. The data for this report can be seen under the Results section and the summary results are presented in Table 1 and Table 2. The detailed 2000 metrics are in Tables 3–6 and Graphs 1–4. The numbers in parentheses in the tables indicate 1999 values. The graphs also include 2001 data for Michigan universities. This data is not available for the other universities since AUTM 2001 data will not be available until early 2003. For total sponsored research dollars, start-ups per $10 million in research expenditures, licenses and options yielding license income and license income received, Michigan universities showed improvement from 2000 to 2001. In addition to UM, MSU, WSU and MTU, Central Michigan University (CMU) and Western Michigan University (WMU) provided data for this report (although not included in tables and graphs). The total sponsored research dollars for 2001 for CMU and WMU respectively were $670,118 and $43,527,812.

Technology transfer professionals summarized their progress over the last year and these reports can be seen in Appendix 1.

RESULTS

Table 1: Summary of Metrics for 1999 and 2000

Metrics	1999			2000		
	MI AVG	NATL AVG	MI AVG NATL AVG	MI AVG	NATL AVG	MI AVG NATL AVG
Licenses and options yielding income	42	48	88%	52	53	98%
Adjusted gross license income received (in thousands)	6,966	4,612	151%	7,584	7,579	100%
Total sponsored research dollars (in thousands)	220,677	169,536	130%	237,657	181,339	131%
Industry sponsored dollars (in thousands)	16,652	16,030	104%	15,935	15,591	102%
Disclosures per $10M research dollars	4.30	4.80	90%	5.20	4.20	125%
Licenses per $10M research dollars	1.60	1.30	122%	1.60	1.40	112%
Number of start-ups	1.00	2.00	53%	2.00	3.00	67%
Start-ups/$10M research dollars	0.04	0.13	31%	0.05	0.14	36%
Conversion rate of disclosures to licenses	32	33	97%	26.9	33.4	81%
Conversion rate of disclosures to start-ups	1.25	2.81	44%	2.7	3.4	79%

Table 2: Summary of Changes from 1999 to 2000

Metrics	% INCREASE/-DECREASE 1999–2000		
	MI AVG	NATL AVG	MI AVG/NATL AVG
Licenses and options yielding income	26%	10%	11%
Adjusted gross license income received (in thousands)	9%	64%	-34%
Total sponsored research dollars (in thousands)	8%	7%	1%
Industry sponsored dollars (in thousands)	-4%	-3%	-2%
Disclosures per $10M research dollars	21%	-13%	39%
Licenses per $10M research dollars	0%	8%	-8%
Number of start-ups	100%	50%	26%
Start-ups/$10M research dollars	25%	8%	16%
Conversion rate of disclosures to licenses	-16%	1%	-16%
Conversion rate of disclosures to start-ups	116%	21%	80%

THE 2ND ANNUAL ASSESSMENT OF TECHNOLOGY TRANSFER AT MICHIGAN PUBLIC UNIVERSITIES

To compare results from year 2000 to 1999, 1999 results are indicated in parentheses in this table and the subsequent tables. The parentheses will include 1999 results for each of the columns represented. For example, UM in 1999 had 90 licenses and options yielding license income and ranked 18th, compared to 111 licenses and options yielding license income in 2000 and ranking of 18th.

Table 3:
Universities Ranked by Number of Licensing and Options Yielding License Income 2000

	Licenses and Options Yielding License Income	Rank
University of CA System	781	1
University of Washington	385	2
Iowa State	379	3
Stanford	378	4
MIT	362	5
Washington University	255	6
University of Minnesota	248	7
Purdue	208	8
Texas A&M	203	9
University Wisconsin—Madison	202	10
Cornell	188	11
Johns Hopkins	166	12
Harvard	163	13
SUNY Research	147	14
University Illinois, Chicago and Urbana-Champaign	146	15
Columbia	143	16
Baylor College of Medicine	115	17
UM (1999—90; 18)	**111**	**18**
Duke	101	19
Virginia Tech	83	20
University of Iowa	82	21
North Carolina State	76	22
Rutgers	73	23
University of Georgia	73	24
University of Virginia	73	25
MSU (1999—48; 35)	**47**	**34**
WSU (1999—12; 91)	**33**	**53**
MTU (1999—18; 78)	**16**	**80**
MI avg (1999—42)		52
Natl Avg (1999—48)		53
AvgBest in Class, not inc. Univ. of CA (1999—255)		294
MI Avg/Natl Avg (1999—88%)		98%

Adjusted Gross Licensed Income Received (in thousands)		Rank
University of CA System	261,522	1
Columbia	138,562	2
Dartmouth	68,427	3
FSU	67,497	4
Stanford	34,603	5
MIT	30,235	6
University of Washington	30,213	7
University of Pennsylvania	26,493	8
University of Florida	26,268	9
Georgetown	26,000	10
MSU (1999—$23,712; 7)	**25,721**	**11**
CA Institute of Technology	23,660	12
University Wisconsin—Madison	22,790	13
University of Minnesota	22,690	14
SUNY Research	16,486	15
Johns Hopkins	14,376	16
University of Rochester	13,400	17
Harvard	12,195	18
Emory	10,672	19
Baylor College of Med.	9,415	20
University Massachusetts	9,053	21
University Texas/Southwestern Med.	8,632	22
NYU	8,484	23
Washington University	8,396	24
Tulane	6,826	25
UM (1999—3,473; 33)	**3,833**	**38**
WSU (1999—458; 85)	**684**	**84**
MTU (1999—222; 102)	**99**	**120**
MI Avg (1999—6,966)		7,584
Natl Avg (1999—4,612)		7,579
Avg Best in Class, not inc. Univ. of CA (1999—35,766)		51,281
MI Avg/Natl Avg (1999—151%)		100%

Table 4: Universities Ranked by Adjusted Gross License Income Received 2000

Table 5: Universities Ranked by Sponsored Research Dollars and their Industry Sponsored Research Dollars, Disclosures and Licenses 2000

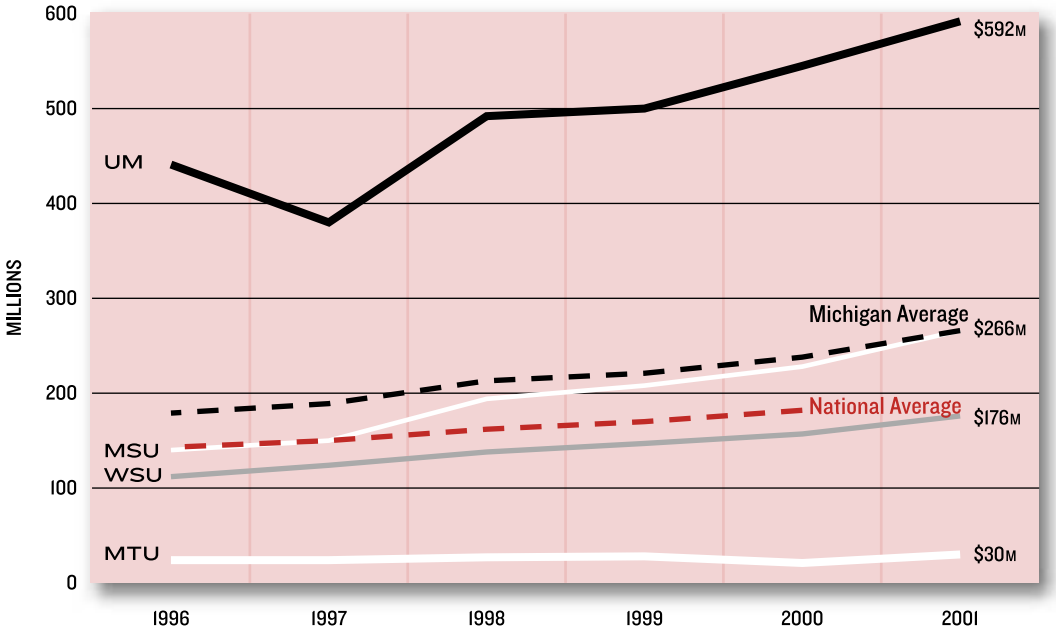
	Total Sponsored Research Dollars (in thousands)	Rank	Industry Sponsored Research Dollars (in thousands)	Disclosures per $10M Research Dollars	Licenses per $10M Research Dollars
University of CA System	2,084,623	1	193,611	4.1	1.5
Johns Hopkins	1,033,802	2	54,000	3.4	1.2
MIT	727,600	3	73,600	5.8	1.4
University of Washington	652,100	4	42,600	3.2	1.9
Univ. Illinois, Chicago and Urbana-Champaign	568,861	5	25,058	3.4	1.4
University Wisconsin—Madison	554,361	6	-	5.0	2.3
UM (1999—$499,722; 4; $35,994; 3.2; 0.8)	**545,000**	**7**	**36,000**	**3.1**	**0.9**
University of Pennsylvania	529,555	8	32,390	4.2	1.2
SUNY Research	448,525	9	17,455	4.1	0.8
Stanford	444,275	10	42,277	5.7	3.6
Penn State	440,259	11	75,199	4.6	0.5
Harvard	430,781	12	18,988	3.1	1.6
North Carolina State	415,617	13	52,829	4.1	1.1
University of Minnesota	411,380	14	26,392	5.3	2.1
Texas A&M	397,268	15	31,084	3.5	1.5
Cornell	396,900	16	12,700	4.5	1.6
CA Institute of Technology	376,000	17	9,000	6.3	1.4
Washington University	364,453	18	30,122	2.3	4.1
University of Arizona	345,090	19	22,412	2.6	1.1
Duke	340,295	20	109,809	-	1.4
University of Pittsburgh	339,345	21	24,600	3.2	0.7
Columbia	311,122	22	11,333	6.2	1.5
University Texas at Austin	295,901	23	40,081	2.9	1.4
University of Florida	294,700	24	58,600	5.6	1.0
Ohio State	289,485	25	45,971	3.7	1.0
MSU (1999—$207, 912; 36; $7,647; 4.1; 1.6)	**227,734**	**33**	**11,230**	**4.2**	**0.8**
WSU (1999—$147, 000; 63; $11,000; 2.7; 0.2)	**156,735**	**59**	**11,000**	**3.0**	**0.6**
MTU (1999—$28,074; 119; $11,967; 7.1; 3.9)	**21,158**	**134**	**5,508**	**10.4**	**3.8**
MI Avg (1999—$220,677; $16,652; 4.3; 1.6)	237,657		15,935	5.2	1.6
Natl Avg (1999—$169,536; $16,030; 4.8; 1.3)	181,339		15,591	4.2	1.4
Avg Best in Class, not inc. Univ. of CA (1999—$464,634; $33,781; 5.8; 2.7)	537,891		42,452	5.2	2.1
MI Avg/Natl Avg (1999–130%; 104%,; 90%; 122%)	131%		102%	125%	112%

	Total Sponsored Research Rank	Number of Start-Ups	Start-Ups/$10M Research Dollars	Conversion Rate of Disclosures to Licenses	Conversion Rate of Disclosures to Start-Ups
University of CA System	1	26.0	0.12	36.2%	3.0%
Johns Hopkin	2	10.0	0.10	35.8%	2.8%
MIT	3	31.0	0.43	24.0%	7.3%
University of Washington	4	6.0	0.09	58.9%	2.9%
University Illinois, Chicago and Urbana-Champaign	5	5.0	0.09	40.8%	2.6%
University Wisconsin—Madison	6	6.0	0.11	45.8%	2.2%
UM (1999—4; 2.0; 0; 26.6; 1.3)	7	8.0	0.15	30.4%	4.8%
University of Pennsylvania	8	6.0	0.11	28.3%	2.7%
SUNY Research	9	4.0	0.09	18.8%	2.2%
Stanford	10	8.0	0.18	64.3%	3.2%
Penn State	11	4.0	0.09	10.8%	2.0%
Harvard	12	1.0	0.02	52.6%	0.8%
North Carolina State	13	6.0	0.14	27.8%	3.6%
University of Minnesota	14	11.0	0.27	39.4%	5.0%
Texas A&M	15	4.0	0.10	41.4%	2.9%
Cornell	16	3.0	0.08	35.6%	1.7%
CA Institute of Technology	17	14.0	0.37	22.5%	5.9%
Washington University	18	1.0	0.03	180.7%	1.2%
University of Arizona	19	2.0	0.06	41.6%	2.2%
Duke	20	3.0	0.09	30.6%	1.9%
University of Pittsburgh	21	5.0	0.15	21.8%	4.5%
Columbia	22	7.0	0.22	23.7%	3.6%
University of Texas at Austin	23	5.0	0.17	48.3%	5.7%
University of Florida	24	6.0	0.20	16.9%	3.6%
Ohio State	25	2.0	0.07	27.4%	1.9%
MSU (1999—36; 1.0; 0; 38.8; 1.2)	**33**	**1.0**	**0.04**	**19.8%**	**1.0%**
WSU (1999—63; 1.0; 0.1; 7.7; 2.6)	**59**	**0.0**	**0.00**	**21.3%**	**0.0%**
MTU (1999—119; 0; 0; 55; 0)	**134**	**0.0**	**0.00**	**36.4%**	**0.0%**
MI Avg (1999—1.0; 0.04; 32; 1)		2.0	0.05	26.9%	2.7%
Natl Avg (1999—2.0; 0.13; 33; 3)		3.0	0.14	33.4%	3.4%
Avg Best in Class, not inc. Univ. of CA (1999—9.0; 0.19; 46; 3)		11.6	0.21	43.3%	3.8%
MI Avg/Natl Avg (1999—51; 31; 97; 44)		67%	36%	81%	79%

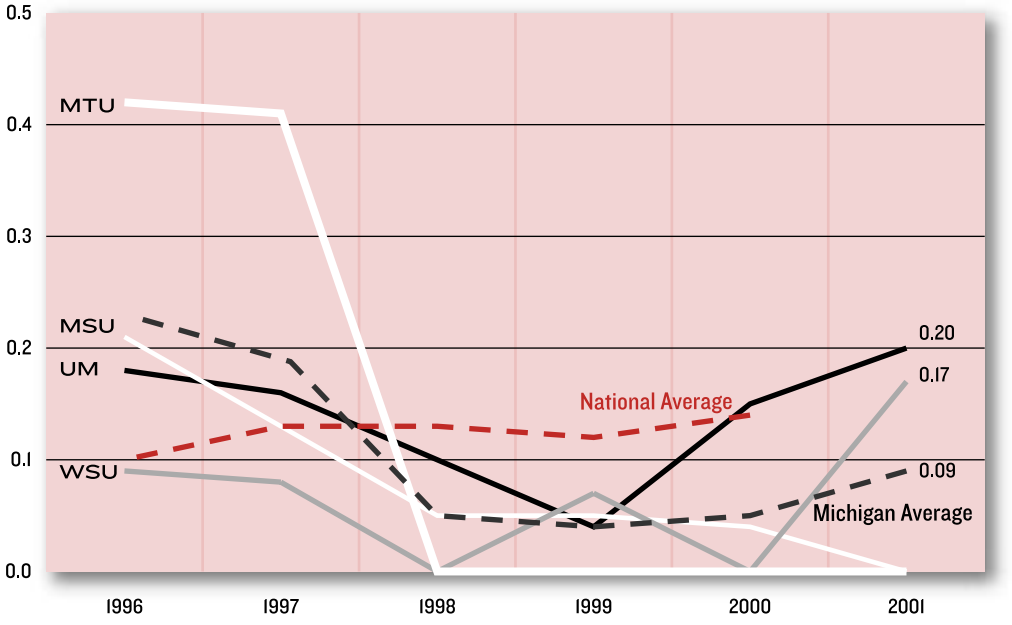
Table 6: Start-Up Activity for Universities Ranked High in Sponsored Research for Year 2000

THE 2ND ANNUAL ASSESSMENT OF TECHNOLOGY TRANSFER AT MICHIGAN PUBLIC UNIVERSITIES

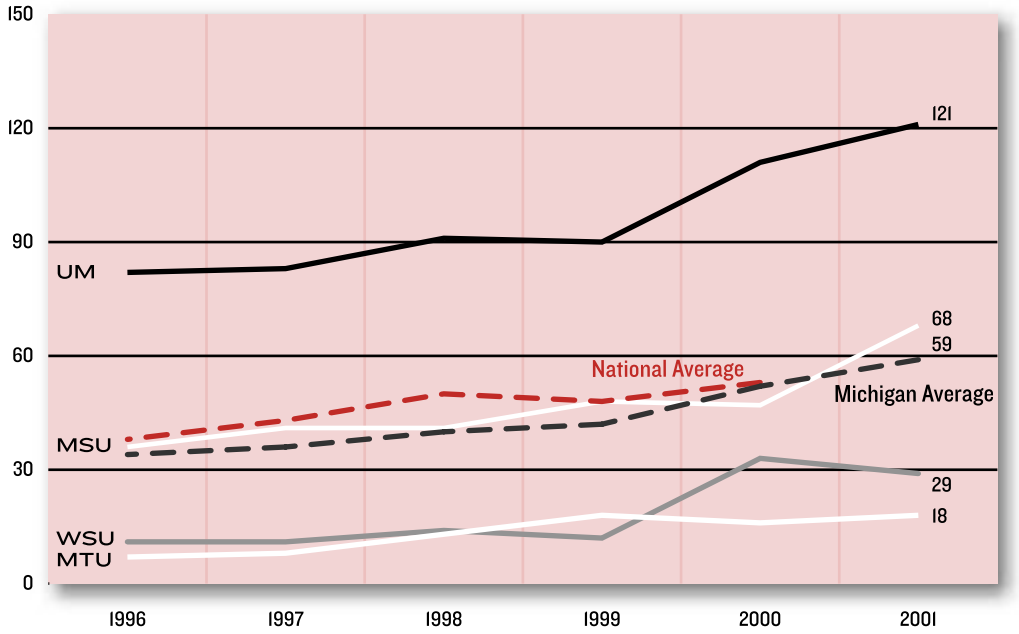
Graph 1: Total Sponsored Research Dollars for Michigan Universities 1996–2001



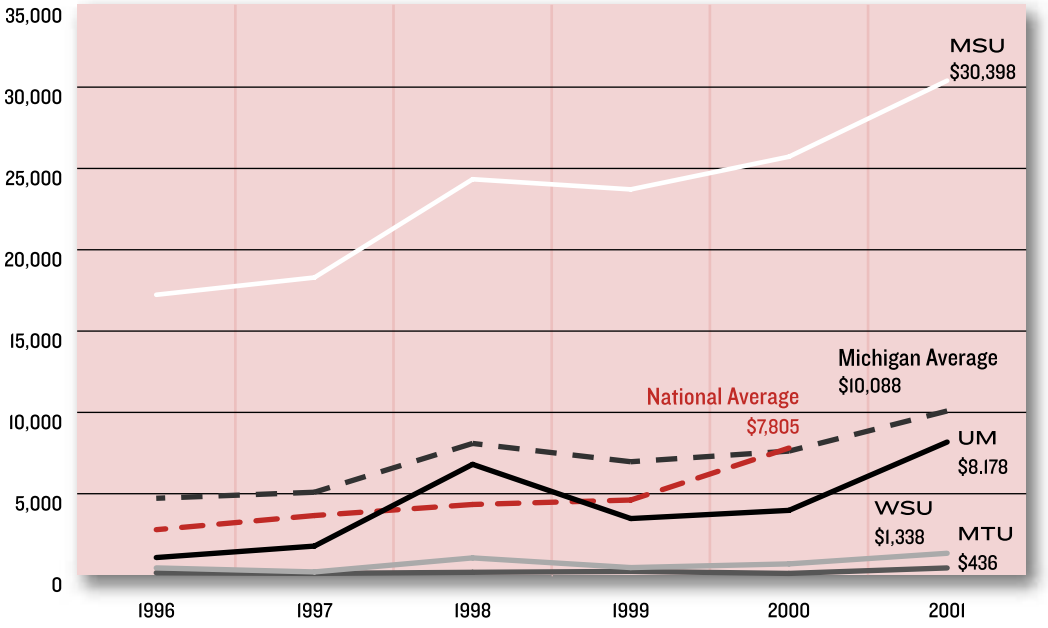
Graph 2: Start-ups per $10 million in Research Expenditures for Michigan Universities 1996–2001



Graph 3: Licenses and Options Yielding License Income for Michigan Universities 1996–2001



Graph 4: License Income Received for Michigan Universities 1996–2001



ACTION PLAN 2002 RESULTS

As indicated earlier, an action plan for fiscal year 2002 was developed as a result of the first annual report to promote improvement in four areas: superior researchers and students, commercialization activity, entrepreneurial support and entrepreneurial infrastructure. The MEDC, universities, and the private sector have delivered outstanding results against the action items outlined in the action plan (the results are indicated below). Measuring efforts or successes in accomplishing these overall goals is not easily quantifiable especially with the publication of the AUTM report lagging the year-end by 15 months. It is clear though from the number of people engaged in MEDC initiatives, including university tech transfer professionals, university administrators, university researchers, venture capitalists, local economic developers and private sector representatives, that everyone's efforts have successfully promoted an entrepreneurial culture here in Michigan. The increased number of collaborative relationships amongst this group is also evidence of a growing entrepreneurial culture. Although many initiatives such as Emerging Technology Challenge Fund (ETCF), Michigan Entrepreneurship Education Network (MEEN) and SmartZone℠ Business Accelerator Programs have just recently been implemented, they all show promise.

Superior Researchers and Students—The Overall Goal is to Improve the Quality and Quantity of Inventions

Goal	Action	Result
Provide incentives for inventors	Sponsor success celebration events	MEDC sponsored the *Investment and Commercialization Success Celebration* event in November 2001. The following companies received awards—ERL, ThermoAnalytics, Arbor Networks, Technology Integration Group Services, Asterand, GeneWorks, HandyLab, Rubicon Genomics, ARCH Development Partners, Dow Chemical Corporation Venture Capital, Ford Venture Capital Group, Michael B. Staebler, Ralph Wilson Equity Fund and XR Ventures. This year's event is scheduled for December 2002.
Provide easy access to entrepreneurial activities	Promote Entrepreneurship Education Network at the Universities and SmartZones℠	MEDC contracted with The University of Michigan Business School's Samuel Zell & Robert H. Lurie Institute for Entrepreneurial Studies to provide an assessment, benchmark and model of entrepreneurship activities in Michigan. The initiative is called the Michigan Entrepreneurship Education Network (MEEN); see Appendix 2 for more details. MEDC provided $2.5 million to six SmartZones to pilot Business Accelerators; see Appendix 3 for more detail.

Goal	Action	Result
Provide gap funding	MEDC and the universities should continue to provide funding through their respective programs, i.e., Michigan Life Sciences Corridor (MLSC), ETCF and University Challenge Funds	Since the inception of the MLSC in 2000, $145 million has been awarded to 78 projects. Over $100 million has been awarded to Michigan universities and the universities have contributed more than $25 million in matching funds. The MLSC Michigan Universities Commercialization Initiative provided $2.5 million in seed funding for university projects through the University Challenge Fund. In the first year, 17 projects were funded totaling over $350,000. The MEDC's Michigan Growth Capital Fund provided grants for management and administrative expenses to start two new venture funds, Arboretum Ventures and SenecaCapital Partners. The MLSC provided over $4 million to early stage, venture capital firms, TGAP, Arboretum Ventures and ApJohn. All four venture capital firms (Arboretum, Seneca, TGAP and ApJohn) will leverage MEDC funds to raise additional funds. The total impact will be $80 million of new venture money. Over the last two years the MEDC's ETCF program provided $2 million to 16 university projects; see Appendix 4 for more detail. The ETCF program requires a 1:1 match from the universities and their collaborators. The universities have contributed over 80% (over $1.6 million) towards the match. The next round of ETCF awards is scheduled to be announced by the end of December 2002.
Promote excellent licensing, marketing and business development activities	Promote tech transfer activities at schools, including schools outside of the four major research institutions. Enlist support of private sector	MEDC annually provides $50,000 to each of the four major research institutions' tech transfer offices to help fund tech transfer positions. The universities also provide funding for these positions. To promote tech transfer activities, MEDC sponsored *Summit 2001—Accelerating the Formation of High Tech Clusters*. A summary of the event was published and is available under separate cover from the MEDC. To continue to promote the universities collaboration with the private sector on tech transfer and start-up activities, the MEDC sponsored the Technology workshop in August 2002; see Appendix 5 for more detail. The Workshop resulted in at least four discussions between the universities and the private sector. In our effort to continue these discussions, and to provide an overview of 2002 activities, the Summit 2002—Promoting Private Sector-University Cooperation & Collaboration is scheduled for December. MEDC provided $100,000 to the SBDC for the FAST program to support technology commercialization. This includes assisting universities in marketing and business development activities. MEDC published the *1st & 2nd Annual Assessment of Technology Transfer* at Michigan Public Universities reports.

Entrepreneurial Support—The Overall Goal is to Promote an Entrepreneurial Culture in Michigan

Goal	Action	Result
Improve relationships between all stakeholders	Sponsor networking events	MEDC sponsored or scheduled Workshops, Summits and Success Celebrations in 2001 and 2002. MEDC sponsored the *Great Lakes Entrepreneur's Quest*, Michigan's business plan competition. MEDC sponsored national events that were held in Michigan: *State Science and Technology Institute (SSTI), COMS, Great Midwest Venture Capital Conference (GMVCC).*
Increase venture funding	Establish a venture fund and/or angel fund	MEDC hired a full time Director of Venture Capital to promote angel and venture capital activities. MEDC led the formation of *Michigan Angels Network* which offered a loose networking opportunity for angels as well as start-up companies. Three meetings were held between May 2001 and December 2001, where a total of 12 start-ups made presentations to potential investors. Two companies were successful in raising $750,000 and $200,000. In 2002, investment leaders from a variety of firms across Michigan formed the Michigan Venture Capital Association (Michigan VCA). Its mission is to help people across the state understand the importance of venture capital and the role it plays in the development of new businesses. A concurrent goal is to establish Michigan as a recognized international leader in the emerging technology industries over the next decade. Participants from regional and local venture capital firms, private equity firms, corporate venture departments and some of the best educational institutions joined to form the Michigan VCA. MEDC's Michigan Growth Capital Fund provided funding for management fees to start two new Angel funds, Arboretum and Seneca. MLSC provided over $4 million to early stage venture capital firms, TGAP, Arboretum and ApJohn. All four venture capital firms (Arboretum, Seneca, TGAP and ApJohn) will leverage MEDC funds to raise additional funds. The total impact will be $80 million of new venture money. MLSC provided funding to the *Michigan Universities Commercialization Initiative* to develop the $2.5 million *University Challenge Fund*. Through this fund money is competitively awarded to university projects. The university must also contribute with a 1:1 match. According to PricewaterhouseCoopers *2001 Moneytree Survey*, capital under management in Michigan has grown from $184 million in 1996 to $2.4 billion in 2001. There are a total of 23 venture firms with offices located in Michigan, 19 of which are headquartered in the state.

Entrepreneurial Infrastructure—The Overall Goal is to Establish Entrepreneurship Centers

Goal	Action	Result
Provide a one stop shop for entrepreneurial services	Promote and showcase Business Accelerators at the SmartZonesSM	MEDC provided $2.5 million to six SmartZones[SM] to pilot Business Accelerators; see Appendix 3 for more detail. The Business Accelerators will assist in providing needed talent to start-up companies. MLSC provided $1.6 million to MichBio to launch a new recruitment campaign for life sciences talent. The program will both attempt to recruit out-of-state talent here, as well as retain university graduates by developing internships and enhancing Internet job board postings. The jobs database will come through an agreement with BioSpace, the largest online provider of Web products and services for the life science industry. The internships will be developed by the Washtenaw Development Council and the national recruitment effort will come in conjunction with Search Masters International and the contract research firm Statprobe, Incorporated.

ACTION PLAN 2003

In the last year, the MEDC and its partners have successfully made progress against their goals of promoting tech transfer and entrepreneurship activities in Michigan. In the upcoming year, the objective will be to continue the promotion and growth of these activities. MEDC plans to monitor and measure the progress of the current initiatives, continue to sponsor events, publish annual reports and work with stakeholders to develop new programs to promote technology led economic development agenda. Specific areas that continue to demand attention are 1) increasing seed funding for new inventions and 2) bridging the gap between the university tech transfer offices and the private sector. Obtaining public funding for new seed funding programs may be difficult in this economic environment. Efforts therefore will be focused on bridging the gap between the university tech transfer offices and the private sector. This may include encouraging and promoting programs that *mine* technology from the universities to solve problems in the commercial marketplace.

THE UNIVERSITY OF MICHIGAN *contributed by Ken Nisbet*

FY2002, despite a challenging economic climate, was a year of solid progress for UM Tech Transfer. Accomplishments include:

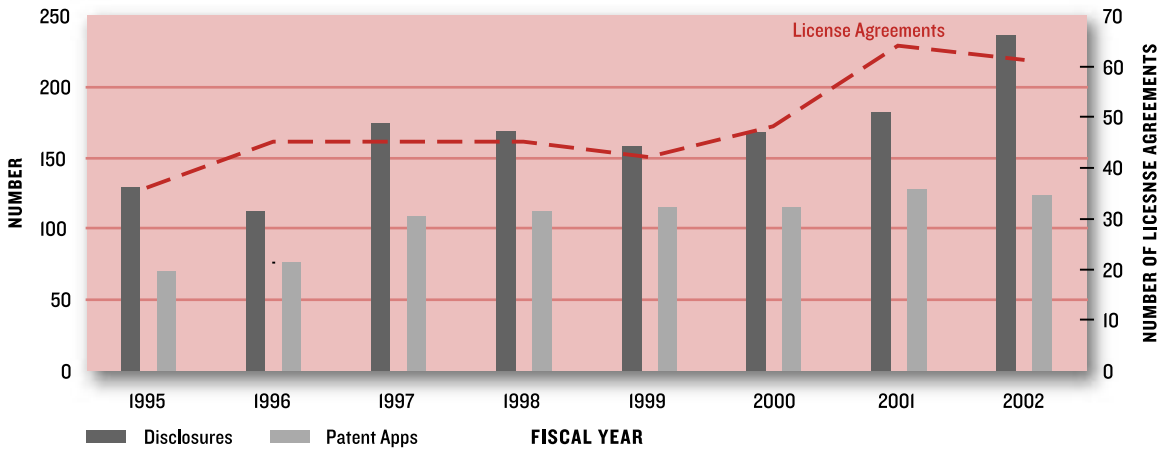
- A substantial increase (30%) in invention disclosures over FY2001
- Increased royalty revenues of 44% over FY2001 (excluding equity sales)
- Although total agreements dropped slightly, medical school agreements increased 15%
- The adoption of a three-year strategic plan, approved by university leadership

University-wide Results

Technology disclosures increased 30% over FY2001, reflecting increased activity by our faculty and proactive efforts to encourage tech transfer. Patenting activity was very similar to last year. Agreements decreased 5% overall, in part due to the economic contractions of our business partners.

After a spectacular year in FY2001 with 12 start-ups, our new business start-up activity decreased to five new businesses launched in FY2002. The dramatic slowdown in venture investing tied to general economic conditions was a big factor. Nevertheless, we continue to build our portfolio of potential and launched start-ups, which reflect the quality of the technology, our partners and our activities.

UM TECH TRANSFER ACTIVITY



Recent UM New Business Start-Ups (** Indicates Michigan headquarters)*

FY1998	FY1999	FY2000	FY2001	FY2002
Clark-MXR*	Gradient*	Enlighten Sports*	Molecular Therap*	Dermaco*
HealthMedia*	Xtera	FreshOnLine*	Nanobio*	Eprogen
IDE, Inc*		HandyLab*	CSCG, Inc*	Velcura*
Intralase		Interlink*	Discera*	Thromgen*
ISSY *		Living Text*	Sensicore *	Quantum Signal*
Tal Materials*		MedCharge*	Arbor Networks	
Visitek*		NextHop	Xeotron	
		Rubicon Genomics*	Translume*	
			Therasonics*	
			KeraCure*	
			Originus*	
			GoKnow*	

Total revenues (license fees, royalty payments and sales of equity) were $5.7 million in FY2002, 30% less than FY2001. However, there were no sales of equity in FY2002, which in recent years was primarily stock issued from Aviron (recently purchased by MedImmune for $1.5 billion). Excluding the sales of equity, royalty revenue increased from $3.9 million to $5.7 million, a 46% increase over FY2001.

Improved Organizational Effectiveness

The UM Tech Transfer organization, comprising the central Office of Technology Transfer and satellite offices in the College of Engineering and the Medical School, made substantial progress in FY2002 in refining its operational model to improve responsiveness and effectiveness.

Both satellite offices worked closely with inventors and their faculty tech transfer committees, leading to a 30% increase in disclosures and better patenting decisions. Overall, we began improvements to our workflow process to handle the increased complexity and volume of work while simplifying agreements and procedures to make it easier to do business with us. Several new faces in FY2002 have strengthened our capabilities and we have worked hard to train, communicate and work effectively as a team to better serve our inventors and business partners.

To encourage our inventors and to improve our ability to connect with our business partners, we invested in several programs to market our technology and our capabilities. In October we staged an improved Inventor's Reception to honor our tech transfer participants, featuring eight technology showcases and community participation. Also in October, we published our first ever *Tech Transfer Annual Report*, which has proven to be an effective tool to reach our business partners. We are leveraging our Web site, press relations, print materials and personal selling to extend the message of service to our inventor community and our desire to connect our technologies with business partners.

Enhanced Collaboration

FY2002 was also a year of deepened collaborations across campus and throughout our community.

The TechStart student internship program, a partnership with the Zell-Lurie Institute for Entrepreneurial Studies, provides student opportunities to work with our technology projects. Graduate students from the Business School, College of Engineering, Medical School, Law School and School of Information provide business assistance to UM startup companies and faculty inventors. Our intensive mentoring process provides a rich educational experience and local job connections after graduation for the interns.

We had numerous collaborations with the Business School including a Life Sciences Conference in February which attracted 250 university and community people to hear a panel of business and tech transfer experts, a November entrepreneurial seminar targeted at faculty and researchers interested in commercializing their inventions through a startup, and several class projects and student club interactions.

UM Tech Transfer plays a major role in activities involving MEDC, our sister research institutions of WSU, MSU and the Van Andel Institute, and various businesses and organizations. These activities include technology and business initiatives such as the Michigan Life Sciences Corridor, the Emerging Technologies Challenge Fund, and the Michigan Universities Commercialization Initiative, all designed to improve and accelerate our tech transfer capabilities.

In FY2002, UM Tech Transfer continued to expand the University's role in the community. We have played leadership roles in re-invigorating MichBio, the statewide biosciences association, and in hosting the 2nd annual BioMed Expo. Similar leadership was provided for the successful collaboration that has resulted in the Ann Arbor-Ypsi SmartZone and the recently awarded Business Accelerator program, designed to strengthen our local infrastructure for supporting new startup businesses. We serve on various local and national Boards including AUTM, Ann Arbor IT Zone, MichBio, New Enterprise Forum, Ann Arbor Chamber of Commerce, Great Lakes Entrepreneur's Quest and the Washtenaw Development Council.

MICHIGAN STATE UNIVERSITY *contributed by Loraine Hudson*

The last 12 months have seen major changes in the MSU technology transfer process. Organizational changes included appointment of a new director of the Office of Intellectual Property, who in turn reports to the new associate vice president for Research & Graduate Studies. Two new professional licensing associate positions will be filled in Fall 2002. Through the generosity of the MSU Foundation, MSU has also secured an increased budget for patenting and associated legal expenses.

MSU has begun active efforts to diversify its intellectual property income portfolio, while simultaneously advancing Michigan's economic development. Start-ups, patent donation licensing and enhanced distribution of copyrighted materials are all components of the diversification strategy. Royalties from the anti-cancer drug carboplatin remain the backbone of MSU's patent-related income stream, which totaled $25.7 million in the FY2000 AUTM reporting year. MSU copyrightable materials generated an additional $1.5 million in royalty income. A middle-grades mathematics curriculum, which was derived from a major NSF grant, and biochemical software that simulates enzyme-substrate docking exemplify recent copyright licensing successes.

With support from a major Michigan Life Sciences Corridor grant, MSU has retained the services of a well-known Michigan business planning and venture capital consultant, to assist faculty-led entrepreneurship. MSU has also utilized consulting assistance from the Small Business Association of Michigan, to guide faculty start-ups in their efforts to obtain SBIR grants. Recent start-ups are focusing on electric utility network reliability, surfactant precursors derived from plant genetic engineering and design optimization in human prosthetic devices.

In Spring 2002, Michigan corporations donated three major packages of patents to MSU, permitting licensing of innovative foods packaging, the inclusion of psyllium in various foods and incorporation of multi-purpose antennas in vehicle windshields. To realize the potential value of these donations through effective technology transfer, MSU has retained the services of two experienced consultants, and has established demonstration projects and equipment in academic units with research interests in the technologies.

WAYNE STATE UNIVERSITY *contributed by Fred Reinhart*

Technology Transfer

In FY2001, WSU's Technology Transfer Office (TTO) continued to provide WSU faculty with service and advice in technology transfer matters. Licensing revenues increased by 95% to $1.3 million, in part as a result of strong sales by a WSU spin-out company, the settlement of a patent infringement dispute by means of licensing, and the licensing of several companies under WSU's patent covering a novel thermal-sonic method of detecting cracks in metal and other materials. TTO doubled the number of patent applications filed and experienced a corresponding 36% increase in patent expenses. Finally, the number of new license agreements increased by 10%.

Venture Development

In March 2001, TTO successfully recruited a highly regarded professional, Howard Bell, as associate director for Venture Development to assist WSU faculty who indicate an interest in starting companies using WSU intellectual property. With this addition, TTO now advises WSU researchers about the challenges of entrepreneurship and assists faculty with commercial feasibility studies, business plan development, company structuring, and fund raising. WSU was instrumental in helping a group of WSU scientists launch and raise initial capital for New Target Technologies (NT2), a company that will focus on drug discovery in the area of diabetes and metabolic disorders.

The goal of venture development ultimately is to foster the creation of two to three start-up companies per year. To accomplish this goal, TTO is establishing readily accessible networks and private entities in

key support areas: angel investors; venture capital firms; business development consultants; executive recruiting professionals; and lawyers/accountants specializing in supporting start-up companies.

To enhance the entrepreneurial environment on the WSU campus, TTO has collaborated with WSU's School of Business Administration to offer a three-credit course on entrepreneurship using MBA student teams to analyze WSU research projects for commercial feasibility. Project results will be used by the venture capital community to assess investment opportunities in various WSU technologies.

Michigan Universities Commercialization Initiative

TTO, partnering with the technology transfer offices at The University of Michigan and Michigan State University, is a co-recipient of Michigan Life Sciences Corridor (MLSC) funding to develop and execute several initiatives for commercialization of university technology. The Michigan Universities Commercialization Initiative (MUCI) will receive funds in excess of $4.7 million over two years.

The initiatives include the establishment of the Commercialization Challenge Fund, with a $2 million, two-year allocation. This life science-focused fund will be used to generate data, prototypes and market information for university developed intellectual property, thus improving the potential for successful commercialization. Fred Reinhart, TTO director, is co-chair of the Incubator Planning initiative. TTO has received funding to hire an incubation facilitator for this initiative. This individual will spearhead the development of a university-linked high technology incubator system and will coordinate with the various SmartZones℠ in Michigan.

Additionally, initiatives to develop a commercialization and entrepreneurial education resource database are funded by this award. Through these efforts, WSU faculty, staff and students will have access to many web-based resources to complement their interactions with TTO and assist with their commercialization and entrepreneurial activities.

Other TTO highlights

- The Emerging Technology Challenge Fund was established by the MEDC and the major research institutions in the state. TTO helped several faculty prepare applications and WSU will receive grants for investigators in Chemistry and the Institute for Manufacturing Research. During FY2001, TTO continued to assist those faculty competing for MLSC Grant awards.
- TTO received an MLSC award to supplement WSU TTO staff. Funding was received to establish two new positions, industrial liaison and technology licensing specialist. The industrial liaison will work with several WSU research centers of excellence and be charged with identifying potential corporate partners and establishing the relationships necessary to promote collaborations. The technology licensing specialist will be responsible for invention management and will provide other technology transfer services for WSU faculty and staff.
- At the request of Drs. Irvin D. Reid and George E. Dambach, TTO initiated a study of WSU's equity holdings from licensing and outlined a process for creating guidelines for the acquisition, management and disposition of such stock holdings.
- TTO is undertaking a comprehensive review of the current WSU Patent Policy. The goals of the review are to ensure that WSU is in compliance with federal (NIH, etc.) and state regulations; update the policy to cover new technologies or non-patented, non-copyrighted technology; fill in policy language gaps to cover the invention handling process, e.g., equity, faculty start-ups, conflict-of-interest, consulting, student and other issues; modify language to reference other WSU policies and avoid inadvertent breeches by WSU; and consider changes in royalty distribution policy requested by faculty.
- TTO had a leadership role in Michigan economic development initiatives and organizations such as the MUCI, Michigan Biosciences Industry Association, the state's annual BioMed Expo and Great Lakes Venture Quest.

During FY2001, WSU professionals played leading roles in AUTM with Anne Di Sante, TTO's Associate Director, serving on the Executive Committee of the Board of Trustees and Fred Reinhart serving as Chair of the Government Affairs Committee.

•In terms of technology transfer activity, the majority of disclosures, patents, licenses and revenues are associated with life science or medical inventions. However, at least one key physical science invention was successfully transferred during FY2001.

•TTO sponsored the third annual Inventor's Recognition Luncheon honoring faculty who, within the previous year submitted invention disclosures, received an issued patent or had their technology licensed. Fifty faculty members attended the event.

•In FY2001, TTO provided funds from its invention development account to support further development of WSU faculty inventions to move them closer to commercialization.

WSU FY2001 Results Compared to FY1997–FY2000

Measure	FY2001	FY2000	FY1999	FY1998	FY1997
Disclosures	39	47	39	37	25
Patent Applications (US)	28	13	18	15	9
Patent Applications (Foreign)	8	5	2	8	10
Patents Issued (US)	15	18	18	10	11
Patents Issued (Foreign)	5	0	2	5	2
Patent Expenses	$277,000	$204,000	$106,000	$200,000	$153,000
Licenses	11	10	3	8	7
Revenues (in thousands)	$1,338	$686	$458	$1,053	$191

Additional Details on Selected Categories:

Disclosures (based on end use)	Life Sciences 69%; Physical Sciences/Engineering 31%
Patent applications (US)	Life Sciences 71%; Physical Sciences/Engineering 29%
Patents issued (US)	Life Sciences 87%; Physical Sciences/Engineering 13%
Patent Costs Reimbursed	$59,800 out of $277,000 (22%) paid by licensees
Licenses	Life Sciences 73%; Physical Sciences/Engineering 27%
Revenues	Life Sciences 88%; Physical Sciences/Engineering 12%

MICHIGAN TECHNOLOGICAL UNIVERSITY *contributed by Peter Radecki*

Michigan Tech continues to realize the benefits of an increased business focus in its technology development and transfer efforts since moving the Office of Intellectual Property and Technology Commercialization under the Department of Corporate Services in 1999. FY2002 was a second consecutive record year for license revenue and continuing growth in the numbers of license agreements, invention disclosures and patents should provide a solid foundation for continued growth.

In the patenting area, the most notable recent event is the issuance of a portal patent related to genetically modified plants with reduced lignin content. The plant biotechnology area at Michigan Tech, which has been a long-standing research strength, is now showing near-term promise for substantial license revenues with several major licenses in place and others in current negotiation. Invention disclosures are up as are the university's level of investment in patent protection.

Startup activity has recently seen a measurable increase. One start-up negotiation is nearly complete and two start-up companies have licenses of MichiganTech technologies pending. All previously initiated startups continue to prosper and grow including three companies that have remained in the local area. In addition to the subset of startup companies that license Michigan Tech technologies, there are a number of startup companies in the local area that do not have license agreements currently in place but nonetheless have resulted from technical developments at or related to Michigan Tech.

With the recent establishment of the Michigan SmartCel[SM] Business Accelerator in collaboration with Oakland University, the Keweenaw Industrial Council, and Automation Alley with funding from the MEDC, Michigan Tech is preparing to offer an expanded level of service to regional startup companies. Michigan SmartCel will focus on companies with potential for significant growth, and will work directly with those companies to acquire the financial, technological and personnel resources needed to achieve fast growth. Coupled with the support of the Michigan Tech Enterprise SmartZone,[SM] enhancing the success of regional startup companies through Michigan SmartCel will provide additional encouragement to aspiring entrepreneurs in the area.

At the undergraduate level, the engineering Senior Design Program, and the Enterprise Program are fostering a growing spirit of entrepreneurship and innovation. The Enterprise Program is a three-year experience (sophomore through senior) where students run *companies* to produce actual manufactured products for sale, or provide engineering services on a contract basis. The Senior Design Program is a one-year capstone design experience involving engineering student teams (four to five students on each team). Each team develops a solution to an individual design task. Teams in both the Senior Design Program and the Enterprise Program are largely supported by industrial funding and have regular interactions with their sponsors. These programs are producing year-over-year increases in number of invention disclosures, some of which have been filed for patent protection and have commercial license potential. Students involved in some of the Enterprise Programs are now giving detailed thought to *spinning out* private companies related to the products or services they are developing as students.

Appendix 2: Michigan Entrepreneurship Education Network (MEEN)

PROJECT

Establish a permanent statewide network of entrepreneurship education programs, called the Michigan Entrepreneurship Education Network (MEEN), to develop and strengthen entrepreneurship education programs in the Universities in the State of Michigan.

PURPOSE

To develop and support entrepreneurial education in Michigan's traditional degree-granting university programs in business, engineering and other professional schools such as medicine. To 1) create templates of entrepreneurial education programs, and 2) create a collaborative network of university and SmartZone℠ stakeholders with common entrepreneurship education interests and 3) develop preliminary plan for self-sustaining MEEN.

GOALS

- Create a template of a comprehensive entrepreneurial education program—i.e., courses, course content, internships, support services—tailored to the unique needs of Michigan's Universities
- Assess the current status of the entrepreneurship education program in Michigan's universities
- Provide recommendations and assistance to the universities to develop their entrepreneurship education programs, deploying MEDC resources to support faculty for delivery and implementation
- Create an enduring, collaborative network of entrepreneurship education programs, called MEEN
- Develop partnership and integration between MEEN and the SmartZone initiatives and other entrepreneurship initiatives
- Improve Michigan's performance in and reputation for entrepreneurial education
- Develop a plan for the creation of a permanent MEEN infrastructure for ongoing, continuing education, networking, and collaboration

PROCESS

Phase I

Identify all participants and pinpoint phase I participants; benchmark national entrepreneurship programs; develop comprehensive entrepreneurship program template and illustrative content; assess current program and develop plan for phase I participants (September 1, 2002–July 31, 2003)

Milestones and Goals

•Identify primary university and SmartZone℠ stakeholders (September–December)

Identify *champion* from each with specific assignment for this activity

•Identify phase I and phase II university participants:

phase I—subset of university programs as initial target (based on criteria to be developed)—approximately six programs;

phase II—second subset, approximately six programs (September–December)

•Benchmark key entrepreneurship programs; develop template of comprehensive entrepreneurship education program (September–January)

•Pinpoint key program elements; develop illustrative program content and supporting materials for each (October–March)

•Phase I
Conduct assessment of current entrepreneurship program for initial set of target universities (8); develop recommendations for program development for each (December–July)

Deliverables

•Deliverable 1
Entrepreneurship Benchmarking Report (due January 30, 2003)

•Deliverable 2
Template of and formal recommendation on comprehensive entrepreneurship education program (due March 30, 2003)

•Deliverable 3a
assessment of phase I universities; develop illustrative entrepreneurship program content and supporting materials for each (due July 31, 2003)

Phase II

Assess current program and develop plan for phase II participants; create networking program and event; develop plan for MEEN permanent infrastructure and marketing (August 1, 2003–February 13, 2004)

Milestones and goals

•Phase II:
Conduct assessment of current entrepreneurship program for second set of target universities (6); develop recommendations for program development for each (August–February)

•Establish criteria and process to administer MEDC funds to support university entrepreneurship program development

•Establish formal network of all MEEN participants (April–October)

•Create initial networking event (October)

•Create matrix assessing current status of entrepreneurship programs of all participants; pinpoint areas of potential collaboration (July–December)

•Benchmark national programs similar to MEEN (August–November); develop preliminary plan for permanent program and infrastructure (November–February)

•Create marketing program for visibility on MEEN

Deliverables

•Deliverable 4
Networking event (due October 30, 2003)

•Administration of $250,000 MEDC fund to support entrepreneurship program development (ongoing)

•Deliverable 3b
Assessment of phase II universities; develop illustrative entrepreneurship program content and supporting materials for each (due January 30, 2004)

•Deliverable 5
Preliminary plan for MEEN permanent program and infrastructure, including marketing plan for MEEN (due February 13, 2004)

Appendix 3: SmartZones℠ Business Accelerators

The following SmartZones℠ received a total funding of $2.5 million to create Business Accelerators. Types of services offered at the accelerators include technology mining, technology assessments, business feasibility studies, business planning, entrepreneurial training, venture capital preparation and introductions, market analysis, product development, management recruitment and business development mentoring.

Grand Rapids SmartZone℠

Supported by Grand Valley State University (GVSU), the Van Andel Institute, Grand Rapids Community College, the city of Grand Rapids and The Right Place Program, the zone has been awarded $300,000 for the accelerator. More than $423,000 in local resources has been committed to further the project. This accelerator will be housed at GVSU's Health Science Building.

Kalamazoo SmartZone℠

Supported by Western Michigan University, Southwest Michigan First and the city of Kalamazoo, this zone will receive $550,000 in accelerator funding. More than $2.46 million in local resources have been committed to further the project. The Southwest Michigan First Innovation Center will house the accelerator.

Michigan Tech Enterprise℠ SmartZone (Houghton)

Supported by Michigan Technological University (MTU), the Keweenaw Industrial Council and the cities of Houghton and Hancock, in cooperation with Oakland University and Oakland County, this zone has been awarded $500,000 for its accelerator. About $600,000 in local resources has been committed to further the project. The accelerator will be located at MTU's Advanced Technology Development Center.

Mount Pleasant SmartZone℠

Supported by Central Michigan University (CMU), CMU Research Corporation, the city of Mount Pleasant and the Middle Michigan Development Corporation, this zone has been awarded $250,000 for its accelerator. About $800,000 in local resources has been committed. The accelerator will be located at CMU's Center for Applied Research and Technology.

Ann Arbor-Ypsilanti Area SmartZone℠

Supported by the cities of Ann Arbor and Ypsilanti, the Ann Arbor IT Zone, the University of Michigan, Eastern Michigan University and the Washtenaw Development Council, this zone has been awarded $500,000 for its accelerator. More than $1.29 million in local resources has been committed to further the project. The Ann Arbor IT Zone will house the accelerator.

Woodward Technology Corridor SmartZone℠ (Detroit)

Supported by Wayne State University, Wayne State University Research and Technology Park, Inc. and the city of Detroit, this zone has been awarded $400,000 in funding for the accelerator. About $1 million in local resources has been committed to further the project. The accelerator will be located at the Wayne State Research and Technology Park.

Appendix 4: Emerging Technology Challenge Fund (ETCF)

	Summary of ETCF Proposals and Awards			
	Received Proposals		Approved Proposals	
	Number	Amount	Number	Amount
Central Michigan University	3	442,773	2	293,713
Eastern Michigan University	2	205,125	2	205,125
Lake Superior State University	1	48,000	1	48,000
Michigan State University	11	1,488,431	5	598,760
Michigan Tech University	2	254,896	1	104,896
Oakland University	2	205,550	1	150,000
University of Michigan	13	1,814,806	2	299,578
Wayne State University	8	906,041	2	299,928
Grand Total	42	5,365,622	16	2,000,000

ABSTRACTS OF AWARDED PROPOSALS

Wireless Integrated Microsystems (WIMS)

Ken Wise
The University of Michigan

The funding request in this application covers the steps required to bridge the gap between scientific research into applications to benefit Center members and the larger commercial community.

Oakland University Center for Entrepreneurial Technology Innovation

Mohan Tanniru, Oakland University

This proposal is to form a Center for Entrepreneurial Technology Innovation (CETI). The mission of the center is to address the needs of the business community in South Eastern Michigan by supporting the development of new IT products using innovative talent coming from Oakland University student and faculty community. CETI will fund potential entrepreneurs including students, alumni and faculty to test their ideas for IT product development with the help of an advisory board and a steering committee, so that the resulting products will have the potential for commercial success. They anticipate that 12 projects will move into the proof-of-concept stage and that six start-ups will be generated.

Environmentally Benign Coatings Based on Donated Patents

Frank Jones
Eastern Michigan University

This proposal's focus is 1) to license patents covering environmentally benign industrial coatings to Michigan companies and companies that supply Michigan industries and 2) to develop prototype coatings for end uses such as the automotive, appliance, and furniture industries. The patents are owned by EMU and were donated by Exxon Mobil Chemical Company.

Entrepreneurship Internships

James Damitio
Central Michigan University

This proposal is to form an Entrepreneurship Internship Program. In these internships, students majoring in Entrepreneurship are matched with start-up companies and venture capital organizations.

Wall Shear Stress in Flow Applications

Ahmed Naguib
Michigan State University

This proposal is to develop, at the proof-of-concept level, integrated sensors and electronics for the wall shear stress measurements in applications involving fluid flow. Specifically, the recently Pulse Width Modulated Constant-Temperature Anemometer (PWM-CTA) will be used to operate an innovative MEMS wall shear stress sensor. This proposal will ensure that these developments can be continued to a stage where the important elements for this new application: 1) low noise, 2) relatively high power, and synchronized operation with the sensor can be assured. Contacts with potential customers and plans for the fabrication of customer-driven application technologies will be considered and reported in the grant's final report.

Concrete Infrastructure Systems Assessment

Parviz Soroushian
Michigan State University

Michigan State University in cooperation with a small business (DPD, Inc.) has developed a technology for quantitative microstructural investigation of concrete. This technology provides effective means for identification and quantification of microstructural deterioration processes in concrete. It facilitates comprehensive condition assessment of concrete-based infrastructure systems for early detection of processes that are detrimental to their long-term viability. This project will develop the business plan and the organizational structure needed to commercialize this technology and tailor the hardware and software systems embodying the technology to best address market needs and initiate promotion of the technology.

Scalable Video for Wireless Devices

Hayder Rahda
Michigan State University

This proposal is to develop a scalable video streaming software platform and related solutions for the wireless Internet. One of the objectives of the proposed effort is to significantly improve the quality of the current software and generate a viable *product quality* MPEG-4 FGS decoder/player that is integrated as part of an end-to-end streaming platform. Moreover, the new software will be integrated into different platforms such as laptops, notebooks and portable devices. The belief is that the proposed project will lead to a compelling streaming solution platform that is based on the most popular open standard for video and multimedia applications. It is also believed that the platform developed under this effort will represent the key element of streaming products to be marketed by a start-up company based in Michigan. The project will also train high-caliber students who can become key players in the proposed start-up or may spawn other start-ups.

Construction of Prototype Self-Structuring Antennas

Edward Rothwell
Michigan State University

This proposal is for the construction of prototype Self-Structuring Antennas (SSAs), a technology recently developed and patented by researchers at Michigan State University. These antennas have the capability of altering their electrical shape in response to changes in their environment or to changes in their intended use. Interest by automobile manufacturers is prompted by their improved performance and by their potential to reduce the number of antennas required for the increasing variety of wireless applications (radio, television, cell

phone, GPS, etc.). By using these prototypes to demonstrate proof-of-principle, the researchers hope to open several potential markets to SSA applications.

Intelligent Indenter Prototype Development

Roger Pryor
Wayne State University

This proposal is to develop an intelligent indenter system prototype that will measure the hardness conventionally and the depth of the case hardened volume ultrasonically without having to cross-section the part. The prototype is to be created under this development program in collaboration with Dia-Tool Corporation of Farmington Hills, Michigan, (a major indenter supplier in the US). This new technology will significantly improve the speed of and reduce the cost of case depth measurement.

Copper Seed Layers

Charles Winter
Wayne State University

A tremendous issue facing the semiconductor industry is that existing methods for copper metallization will not meet future demands for integrated chip manufacturing. The size of the copper metallization market is staggering: sales are expected to exceed $9 billion dollars by 2005 and margins routinely exceed 60%. As a result, there is a very large opportunity for a new copper metallization process due to the explosive growth in markets for faster computer processors, cell phones, automotive chips and sensors and consumers' electronics. This proposal is to develop and market a new process for placing copper into microelectronics circuits. The proposed invention consists of two components: 1) a machine for deposition and a copper nanocrystal ink and 2) the synthetic method must be scalable so that thousands of kilograms of coated particles can be made in a large reactor. The grantee will work with a chemical synthesis partner to engineer the appropriate reactor configuration and process conditions.

Increasing Undergraduate Entrepreneurial Experience

Morrie Walworth
Lake Superior State University

The proposed project goals include developing several industry partners and establishing internship opportunities for students. Faculty and students will work on the applied research projects with the industry partners and emphasis will be placed on students gaining skills in project management, research methodology, and "real world" engineering. Students will understand how to realize the maximum commercialization potential of their research activity and may pursue the creation of their own business after graduation. The proposal plans to develop at least two research-oriented academic/industrial collaborations, create at least four research-oriented internships, and involve at least two LSSU faculty.

UM-TMO Technology Transfer

Ken Nisbet
The University of Michigan

This proposal is to develop three vital areas relative to the collection and implementation of detailed market data for the Tech Transfer Management Office. The areas that are proposed for development efforts are: TechStart: Student Internship Program, Tech Base: Resource Database and Consultant Utilization. The TechStart program would place six students in interdisciplinary teams to construct commercialization strategies for University technologies. The TechBase program would construct a resource database to house, sort, and qualify the various non-University resources available to university personnel. Lastly, funds will be used to acquire business resource specialists when needed in commercialization activities.

Snow Paver Commercialization

Jay Meldrum
Michigan Technological University

The purpose of this proposal is to conduct domestic and international market studies for a new tool for grooming snowmobile trails. Funds will also be used for the manufacture of a marketing prototype. The Keweenaw Research Center of MTU has developed

this tool under a Small Business Innovation Research (SBIR) grant and funding from the DNR. The tool has passed field trials and a second-generation prototype has been built. A patent application has been filed to protect this technology. MTU intends to commercialize this technology through licensing to a manufacturer with an established distribution network. MTU intends to use the market study resulting from this proposal to find the appropriate partner and execute a business relationship.

Green Chemical Process Development of Biobased Succinic Acid

Dale LeCaptain
Central Michigan University

The proposal provides internships at a high-tech company (LEC TECH Inc.) that is developing a better method for producing succinic acid. This method will be energy efficient and environmentally friendly and will include the regeneration and recycling of by-products. It is also estimated that the end products produced from succinic acids will be produced at lower costs. The intent of this proposal is to foster technology development activities at CMU in cooperation with LEC TECH, train students in chemical technology and product marketing, and commercialize *green* processing of succinic acid within the state of Michigan.

Fostering Hi-Tech Entrepreneurship at Michigan Universities by Creating 20 Internships and a Faculty Network

Pradeep Chowdhry
Eastern Michigan University

The objective of this proposal is to develop a self-sustaining internship and faculty networking program across the various state universities focused on fostering entrepreneurship in the three high-tech clusters: life sciences, advanced manufacturing and information technology. The proposal will provide internships for students and proposes to hold networking activities to bring entrepreneurship activities at various universities together. The activities or conferences will be forums for students and faculty to share their experiences and establish important linkages for interdisciplinary collaboration.

An Integrated Engineering Entrepreneurship Program with Company Specific Product/Business Opportunity Analysis

Ramani Narayan
Michigan State University

The purpose of the proposal is to place engineering students as interns at small/medium companies. The interns will work as two man teams at the companies. The goal for each team, comprising the students and company representatives, is to come up with an important (key) innovation/idea and develop a business feasibility plan (product business opportunity analysis) focusing on both technology and business aspects. The key is that the students will work with company representatives to identify this idea rather than the company identifying the problem and directing the research. The Kauffman Foundation's Fast Trac *Business Mentor* CD-ROM, Planning and Growing a Business Venture work book, will be used in the teaching and development of the feasibility plan. Corporate sponsors have already been identified.

Appendix 5: Workshop Summary

EXECUTIVE SUMMARY

Michigan is the home to 15 public universities that annually receive close to $1 billion in sponsored research dollars. The universities are actively involved in technology transfer operations especially, The University of Michigan, Michigan State University, Wayne State University and Michigan Technological University where staff are dedicated to promoting and facilitating licensing arrangements and start-up companies. Michigan universities received $28 million in licensing revenue in 1999, though only $600,000 was from Michigan companies. It should be noted that $24 million of the $28 million was received by MSU and includes mostly revenue for their anticancer drugs Cisplatin and Carboplatin. In the spirit of promoting technology-led economic development in Michigan, the Michigan Economic Development Corporation (MEDC) joins the Michigan universities in wanting to see more technology transfer from Michigan universities to Michigan companies. Specifically the MEDC and the universities are dedicated to promoting the licensing of university technology to existing Michigan companies and promoting more Michigan *spin-out* companies from the universities.

In an effort to drive the adoption of Michigan's university technology by Michigan companies, a technology workshop was held on August 15, 2002, at the James B. Henry Center at Michigan State University. More than 80 attendees, that included university technology transfer professionals, university researchers and administrators and high tech company representatives, attended the event. The first goal of the workshop was to bring companies and universities together to promote the licensing of university technology to existing Michigan companies. To do this, university tech transfer professionals and university researchers need to know more about the technology requirements of Michigan companies. We therefore invited a select set of companies to discuss their technologies, needs and thoughts about potential collaborations and their technology transfer experiences. This sparked lively discussion with the audience of tech transfer professionals and university researchers and promoted matchmaking between the presenters' technologies and university research projects.

The second goal was to promote more Michigan located university *spin-outs*. We invited university tech transfer staff and representatives from the Small Business Development Centers (SBDC) and the Small Business Association of Michigan (SBAM) to discuss their roles in assisting university start-up companies. These presentations demonstrated success stories at our universities and additional resources available for universities and entrepreneurs for facilitating start-up companies. Overall, the workshop was a success because it encouraged collaboration and facilitated networking between the stakeholders, the universities and the businesses, that play a major role in moving appropriate university technology into the Michigan marketplace. In addition to providing introductions amongst the stakeholders, deals were initiated and follow-up meetings were scheduled between university professionals and businesses.

RESULTS

The workshop began with presentations from technology transfer executives. Ken Nisbet from The University of Michigan (UM), Norm Pollack from Michigan State University (MSU), Fred Reinhart from Wayne State University (WSU) and Peter Radecki from Michigan Technological University (MTU) identified strengths in their portfolios that are relevant to

Michigan industries. They also identified important factors that contribute to successful tech transfer arrangement. They highlighted that the more universities know about companies in Michigan and specific people at the companies, and vice-versa the more likely collaborations will occur. They emphasized the importance of keeping the university inventor involved in the start-up company situations. In the university-industry research collaborations, it is imperative to have good relationships between the researchers in both areas. Although tech transfer procedures are similar across the universities, there may be some differences in tactics depending on technology areas of strength, community resources, etc. All the representatives welcomed industry to contact them to further discuss collaborations. Other Michigan universities were represented in the audience including Brian Anderson from Eastern Michigan University, Kathy Wilbur and Craig Reynolds from Central Michigan University, Jack Luderer from Western Michigan University, Randy Hansen from Oakland University, Tim Clark from Saginaw Valley State University, Karim Nasr from Kettering University and Vladimir Ventsevich from Lawrence Technological University.

Martin Dober from the SBDC and Mark Clevey from SBAM presented their organizations' role in assisting high tech start-ups, specifically assisting with writing SBIR/Small Business Technology Transfer Program (STTR) grants and business and commercialization plans.

Representatives from the alternative energy sector led the first company presentation session. Bill Orabone from T/J Technologies, Anand Gangadharan from Novi Energy, Jim Kezerle from Ricardo, Inc. and Himesh Dhungel from STM Power, Inc., presented their technology needs. Steve LeBeau from Thixomat, Inc., Rich Cook from X-Rite, Inc. and Dwight Morgan from POM Group, Inc., presented their technologies as related to the manufacturing sector. The final company presentations were from representatives from the bioterrorism sector including John Lindsay from Lexatronics LLC, Lallan Giri from BioPort Corporation, Linda Vengroff from NanoBio Corporation and David Hoadley from VI Engineering, Inc.

The overall message from the companies is that they can help bridge the gap between the universities and the marketplace. Not only may they have needs in their organizations for complementary technology from the universities, the companies also have the advantage of knowing their markets and customers. The companies have the experience in marketing and commercializing technologies and can help the universities in these areas. From the perspective of the companies, to promote better private sector-university collaboration and tech transfer activities, the universities need to package their technologies and approach companies with their portfolios. Companies are not looking for ideas; they are looking for solutions to market problems. They want the university to provide products or technologies that solve problems and then the companies will market and commercialize the product or technology. The companies also strongly communicated that they want the assurance that the scientist or inventor is committed to the project.

Many university tech transfer offices are not only posting their technologies on their websites, they have also expanded their staff and/or contracted consultants to assist with business development efforts. These business development individuals are identifying market needs for university technologies as well as meeting potential customers to better understand the potential of the technologies. From the university perspective, rather than Michigan companies waiting to be approached by the universities, companies can improve their competitiveness by actively researching the capabilities and technologies available at the universities. In turn, the universities would welcome the companies approaching them with collaborative opportunities.

As evidenced here, the companies and the universities may have different approaches to bridging the gap between the universities and companies, though they both agree that bridging this gap will lead to benefits for both parties. Both parties are committed to working together to build cooperation and collaborations. It should be noted here that another attendee of the Workshop indicated that technology brokers or integrators could play a mediating role between universities and companies. The technology brokers could be companies or individuals with the expertise and focus to *mine* the universities for technologies that solve market problems and then match the technology with the appropriate company.

MEDC is committed to promoting collaborative relationships between universities and industry. A Technology Summit and Success Celebration event to recognize the winners in the technology transfer area is scheduled for December 9, 2002, in an effort to continue building these relationships.

Some relationships that resulted from the workshop include Oakland University meeting with Ricardo, Inc. Southwest Michigan First contacting X-Rite, Inc. and The University of Michigan meeting with Troy Polymers and Thixomat, Inc. Lexatronics personnel met with representatives from VI Engineering and identified several potential areas of future collaboration.

Tj Technologies met with a number of universities to discuss collaborative projects. An attendee from the United States Army indicated to Lexatronic's that they might ask for Lexatronics assistance in the future. BioPort Corporation has started a preliminary discussion with NanoBio. Martin Dober introduced Quantum Controls to STM Power in an effort to help STM Power fill a *technology gap*. A chemistry faculty person from CMU made a contact at the workshop that resulted in a plan to work together on STTR or SBIR.

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