Michigan State University

College of Engineering

Strategic Plan

(2009-2014)

“...in pursuit of leadership in research, education, and technology transfer”
What We Stand For

Mission (where we are and what we do today)
At Michigan State University, the mission of the College of Engineering is: “To deliver the highest quality engineering graduates, cutting-edge research and innovative technology for the benefit of society locally and globally.”

Core Values (basic, sustaining beliefs)
The College of Engineering is guided by the following core values in delivering its mission and pursuing its vision.

We believe, as a land-grant university, in educating people with the necessary skills to advance the engineering “state of the art.” Imparting knowledge to students at all levels including secondary, undergraduate, graduate, and lifelong learning is implicit in this core value.

We believe in the discovery of new knowledge through innovative research that encourages entrepreneurship and economic development to benefit our global society.

We believe in inclusiveness and collaboration on a worldwide basis. We both teach and follow ethical, environmentally responsible engineering practice.

Vision (where we want to be in five years)
The Vision of the College of Engineering is: “To be recognized as an international leader in engineering education, research and the application of knowledge to benefit society globally.”

Role of the College of Engineering Strategic Plan (ESP)
The role of the College of Engineering Strategic Plan (ESP) is to act as a guide for efficiently achieving our long-term leadership goals. The process of building the ESP has helped us to focus on the Key Strategic Issues (KSIs) that must be addressed if we are to meet the needs of our students, faculty, external partners and the university over the plan period.

While no plan is perfect or can accurately forecast the future in every respect, the ESP lays out the issues, strategic objectives and action plans to better anticipate and respond to future challenges and opportunities. The five-year plan period is for the 2010-2014 calendar years.

Mission
As shown on the verso page, the College of Engineering (CoE) mission clearly states what the nature of our business is in today’s educational environment. Important factors embedded in the mission include educating the highest quality graduates, producing cutting-edge research and generating innovative technology.

Core Values
Core values guide MSU Engineering day-to-day activities and choose the course for future action. Our core values are vital to maintaining our long-term viability, especially including “educating people,” “discovering new knowledge,” and “preserving inclusiveness.”

Vision
The CoE vision is vital to building a road map to where we want to be in five years. Global leadership in education and research are critical to the vision as is the application of new knowledge.
Developing Key Strategic Issues (KSIs)

1. Leadership in Research

2. Leadership in Education

3. Leadership in Technology Transfer

The ESP Team Process

Through a series of team dialogues, the ESP team followed a process that led to consensus on three KSIs the College of Engineering must address if the five-year vision is to be realized. After agreeing on mission, core values and vision, the team brainstormed the Strengths, Weaknesses, Opportunities and Threats (Appendix A1) facing CoE that ultimately pointed the team toward agreement on the three KSIs on the verso page.

The KSIs are not independent of one another. In fact, the KSIs are clearly interdependent. Addressing any one issue will have an impact on the other issues.

Overview of Strategic Objectives for Leadership

Strategic objectives were developed to help address each of the KSIs. They encourage new ways of doing business. As the following pages illustrate, the strategic objectives summarized below guided the “mapping” of detailed action plans toward addressing each of the Key Strategic Issues and the ultimate vision of leadership.

- Increase External Funding
- Increase External Recognition
- Recruit and Retain Higher Quality Students
- Establish the MSU Engineering Education Research Institute
- Establish the MSU Applied Research Institute
- Improve Industrial Collaboration and Entrepreneurship

The following pages summarize the importance of the strategic objectives above, the influence of peer institutions, and how they will help address each of the KSIs.
Strategic Objectives for Leadership

Establish a Comprehensive Strategy for Increased Funding

- The key to building and sustaining a robust research program is a healthy funding support system. Faculty at all Research 1 Universities have to deliver results as well as raise funds to support their research personnel (e.g., research professors, post-doctoral associates and PhD students). Research is a critical ranking success ingredient as reflected in a number of metrics (e.g., funding per faculty, number of PhD students, and number of publications). Recognition of faculty members by way of peer awards (NAE/NAS membership, fellows of societies, etc.) relies on long-term performance that, in turn, depends on sustainable research funding.

- Fundraising in the College of Engineering at MSU has been on the upswing over the past few years (i.e., rising from $20M in 2000 to about $35M in 2007). Prior to 2000, funding leveled off at around $20M for almost a decade (Appendix A18). While this recent increase is laudable (especially with dramatic state funding reductions) most of the growth has occurred in the last three years, and has not produced any positive ranking impact on our peer group. In fact, competitive comparison data suggest that we need to show further improvement, as most peer institutions have achieved higher funding levels. The key metric that we have sought to impact is the dollars raised per faculty equivalent (FTE), which currently stands at ~$200K/FTE. Most of our peer universities are at ~$250K/FTE.

- We suggest developing a holistic approach to bolster funding performance. Thought-starter action plans are listed below. Several approaches should be investigated, including developing stronger ties with funding agencies, seeking more program manager contacts, establishing more multidisciplinary collaborations, creating more center-type activities and better marketing of MSU research talent.

<table>
<thead>
<tr>
<th>Strategic Objective</th>
<th>Action Plan(s) (Lead Responsibility)</th>
<th>Metric(s)</th>
<th>Completion Timing</th>
<th>Key Strategic Issue (KSI) Benefiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase $/FTE</td>
<td>Increase 5/FTE (Associate Dean Research)</td>
<td>10% Annual Increase</td>
<td>4Q10</td>
<td>Research</td>
</tr>
<tr>
<td></td>
<td>Increase Centers (Faculty Chairs, Dean)</td>
<td>1 New Center every 3 years, Increase Research Faculty 5/year</td>
<td>4Q14</td>
<td>Research</td>
</tr>
<tr>
<td></td>
<td>Increase Internal Core Investment for Research (Dean, University)</td>
<td>5 Year Investment @ $120K/Dept/Year for Recruiting, Annual Sabbatical Plans</td>
<td>3Q14</td>
<td>Research</td>
</tr>
<tr>
<td></td>
<td>Increase Graduate Scholarships (Associate Deans)</td>
<td>10% Annual Growth Rate</td>
<td>1Q14</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td>Increase Undergraduate Funding (Residential College Director, Selected Faculty)</td>
<td>5% Annual Growth Rate</td>
<td>1Q13</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td>Increase Post-Baccalaureate Funding (Associate Deans, Selected Faculty)</td>
<td>One New Industrial Funding Source/Year/Department</td>
<td>4Q14</td>
<td>Education</td>
</tr>
</tbody>
</table>
### Strategic Objectives for Leadership

**Establish a Comprehensive Strategy for Increased Funding**

**Increase External Recognition for Faculty and Students**

**Recruit and Retain Higher-Quality Students**

**Establish the MSU Engineering Education Research Institute**

**Establish the MSU Applied Research Institute**

**Improve Industrial Collaboration and Entrepreneurship**

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### Increase Recognition for Faculty and Students

The external perception of the college is critically dependent on the external recognition of faculty and students. The external image of the college has a significant impact on ranking. Therefore, it is crucial for the college to increase the external recognition of its faculty and students if we are to be "recognized as a leader in research and education."

Faculty at peer institutions (e.g., Big Ten Plus colleges of engineering) generally have greater visibility than our faculty. That visibility is evidenced through NAE memberships; national awards, honors and keynote presentations; better journal publication records; more leadership in large national research and education initiatives; and presentations at, and partnerships with, leading international universities. We must increase our faculty expectations and support them so that they can elevate their visibility to the level of our peers.

One important attribute of leading institutions is the number of their graduates who are interviewed and placed as faculty at the best U.S. research universities and top-tier universities abroad. In general, our students are performing world-class research. However, in order for our students to compete for faculty positions, we must better prepare them by requiring that they publish and present their work in prestigious journals and conferences, and by mentoring them to be ready for all aspects of an academic career, including proposal writing, teaching and involvement in professional technical committees.

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</tr>
</thead>
<tbody>
<tr>
<td><strong>Increase External Faculty Recognition for Research and Pedagogy</strong> (Faculty, Chairs)</td>
<td>Rank in Top Quartile of Peer Institutions</td>
<td>Ongoing</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td><strong>Increase External Research-Based Student Recognition</strong> (Students, Faculty, Chairs)</td>
<td>Target 100% PhD, 50% MS Thesis Student Journal Paper Submissions, ConferencePresentations by 2013</td>
<td>4Q12</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td><strong>Improve Research Image</strong> (Dean, Chairs)</td>
<td>10% Annual Growth Rate of Publications to Selected Forums</td>
<td>Ongoing</td>
<td>Research</td>
<td></td>
</tr>
<tr>
<td><strong>Increase External Faculty Recognition for Education</strong> (Faculty, Chairs)</td>
<td>Top Quartile Ranking among Peer Institutions in Journal Publications and Keynotes/FTE</td>
<td>Ongoing</td>
<td>Education</td>
<td></td>
</tr>
<tr>
<td><strong>Increase External Student Recognition for Education Initiatives</strong> (Students, Faculty)</td>
<td>50% PhD, 25% MS and 10% Undergraduate Participation in Education Journal Submissions, ASEE Presentations within Plan Period</td>
<td>4Q14</td>
<td>Education</td>
<td></td>
</tr>
<tr>
<td><strong>Improve Education Image by Increasing Effectiveness of External Publicity and Marketing of Education Programs</strong> (Dean, Chairs, Publications/Marketing Staff)</td>
<td>10% Increase/Year in Publications to &quot;Best Leverage&quot; Sources</td>
<td>2Q09</td>
<td>Education</td>
<td></td>
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</table>
Strategic Objectives for Leadership

Establish a Comprehensive Strategy for Increased Funding

Increase External Recognition for Faculty and Students

Recruit and Retain Higher-Quality Students

Establish the MSU Engineering Education Research Institute

Establish the MSU Applied Research Institute

Improve Industrial Collaboration and Entrepreneurship

Recruit and Retain Higher-Quality Students

In 2007, MSU had the highest percentage of international students in engineering PhD programs (74%) among both Big Ten and Big Ten Plus institutions (Appendix A19). The correlation between U.S. engineering college rankings and a high percentage of well-qualified domestic students is strong. The most readily accessible high-quality domestic students are our own best students. Government, industry and other universities recruit our best engineering undergraduates actively. The first step in increasing the fraction of high-quality domestic graduate students is to more effectively recruit our own best students.

An integrated undergraduate and graduate recruitment program for our engineering students will strengthen the educational experience for our students, the research programs of our faculty and the international reputation of the College of Engineering. To be a recognized leader in research, education and technology transfer, we must score well in national surveys of engineering programs.

We can improve both the retention rate and quality of our best students with an integrated program that introduces students to our research programs, trains them in productive research, produces loyalty to our research groups and actively engages them in MSU engineering graduate programs. An integrated program must reduce barriers between BS, MS, and PhD programs while building strong student research skills. The action plans proposed below start at the freshman level, progress through active upper-division research activity, offer an intensive MS program to develop independent research skills, and culminate in a sound PhD program. Through a strong integrated recruitment program, the College of Engineering can take the first steps in developing a research culture that strengthens our education and research programs toward our vision of leadership in education and research.

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<th>Key Strategic Issue (KSI) Benefiting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruit and Retain More High-Quality Students</td>
<td>Include &quot;Introduction to MSU Engineering Research&quot; for Freshman (Chairs)</td>
<td>UG Research Participation</td>
<td>3Q09</td>
<td>Research, Education</td>
</tr>
<tr>
<td></td>
<td>Integrate &quot;Professorial Assistant&quot; Program into Research Programs (Chairs, Dean)</td>
<td>PA Research Participation</td>
<td>1Q10</td>
<td>Research, Education</td>
</tr>
<tr>
<td></td>
<td>Promote Joint BS-MS Engineering Programs Including: an Integrated Junior, Senior and MS Thesis Program; Junior and Senior Paid Research Aide Positions; and a Summer UG Research Internship (Dept Grad Coord)</td>
<td>BS-MS Program Participation</td>
<td>3Q10</td>
<td>Research, Education</td>
</tr>
<tr>
<td></td>
<td>Create Graduate Summer Research Internships for May Graduates Admitted into Graduate Programs (Chairs)</td>
<td>Retention of Highest Quality Students</td>
<td>3Q09</td>
<td>Research, Education</td>
</tr>
<tr>
<td></td>
<td>Promote Accelerated Engineering PhD Entry Program (Dept Graduate Coordinators)</td>
<td>Program Participation</td>
<td>4Q10</td>
<td>Research, Education</td>
</tr>
<tr>
<td></td>
<td>Encourage Coursework Requirements for PhD students (Dept Grad Coordinators)</td>
<td>Graduate Course Enrollment</td>
<td>4Q10</td>
<td>Research, Education</td>
</tr>
<tr>
<td></td>
<td>Recognize Completion of Comprehensive Examination with Advancement to PhD Candidacy (Dean)</td>
<td>Mean Time to Comprehensive Examination</td>
<td>4Q10</td>
<td>Research, Education</td>
</tr>
</tbody>
</table>
Establish a Comprehensive Strategy for Increased Funding

Increase External Recognition for Faculty and Students

Recruit and Retain Higher-Quality Students

Establish the MSU Engineering Education Research Institute

Establish the MSU Applied Research Institute

Improve Industrial Collaboration and Entrepreneurship

Establish the MSU Engineering Education Research Institute

Available literature points to the declining interest of domestic prospects in engineering education in the United States. Despite the fact that entering engineering students tend to be better qualified than the “average” university student, engineering student retention is an increasing concern. Students cite many disincentives including workload, irrelevance of course work to real problems and unfair tests (low averages), among others. It is clear that if we want to retain good students, we need to re-examine our approach to engineering education. It is also clear that similar challenges apply to the retention of U.S. students in engineering graduate schools.

While there have been numerous reports on ways to improve engineering education (e.g. active learning, clearer objectives, better testing regimes, curriculum flexibility), we must find creative ways to better integrate these and other ideas into our curricula. Many other institutions acknowledge this problem and have established institutes or centers to better coordinate education and engineering expertise. Princeton, MIT, Purdue, UIUC, Wisconsin and Washington State are among those stepping up to this challenge.

MSU Engineering has recently been awarded an NSF grant for the CPATH project, which focuses on engineering education to better meet changing workforce needs. CPATH could form the foundation for the MSU Engineering Education Research Institute (MEERI), which would focus on collaborative pedagogical research (with the College of Education and others) as well as practical curricula improvements. MEERI would effectively support our thrust to improve the undergraduate educational experience (reworking of curriculum 101 and 102, Residential College, etc.) and ultimately help MSU Engineering achieve “recognized leadership in education.”
Strategic Objectives for Leadership

Establish a Comprehensive Strategy for Increased Funding

Increase External Recognition for Faculty and Students

Recruit and Retain Higher-Quality Students

Establish the MSU Engineering Education Research Institute

Establish the MSU Applied Research Institute

Improve Industrial Collaboration and Entrepreneurship

Establish the MSU Applied Research Institute

Complex global challenges will depend more than ever on the ability of engineers to implement solutions for complex interdisciplinary problems. The recognition and ranking of the College of Engineering will increasingly depend on our ability to conduct world-class research and to educate engineers to become accomplished leaders working at the intersection of science, business and society, enabling the transfer of new knowledge for the benefit of society.

Establishment of the MSU Applied Research Institute (MARI) will offer the College a unique opportunity to increase productivity, thereby offering greater value to Michigan, the nation and the world. This institute would develop a strong research capability in selected focus areas of engineering application. This would position the institute to attract additional research funding from industry for product design, fabrication and evaluation in a broad range of applications. The mission of MARI would be to conduct applied research, develop innovative engineering solutions to important problems and nurture emerging technologies. The government, industry and academia all represent potential partners supported by a full-time research staff (separate physical facility with flexible laboratory space on or near the MSU campus).

Several respected peer institutions (e.g., Georgia Tech, Penn State) have shown that the applied research institute concept has several important advantages. Among these are increased ability to respond to new research opportunities, increased research funding from industry and government agencies, and practical research and educational experiences for all MSU students. Additional opportunities include prestigious PhD graduate placement, better opportunities for intellectual property development, potential for economic spin-offs in the region and stronger connections between the engineering alumni and the college.

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</tr>
</thead>
<tbody>
<tr>
<td>Establish the MSU Applied Research Institute (MARI)</td>
<td>Select external organizations with a Stake in MARI (Assoc Dean Research)</td>
<td>Validate Stakeholders</td>
<td>3Q09</td>
<td>Research, Education, Tech Transfer</td>
</tr>
<tr>
<td></td>
<td>Assemble Core Group of Institute Faculty (Dean, Assoc Dean)</td>
<td>Core Group Appointed</td>
<td>3Q09</td>
<td>Research, Education, Tech Transfer</td>
</tr>
<tr>
<td></td>
<td>Write a MARI Business Plan and Get Buy-In from The MSU and Other Private Foundations (Core Group)</td>
<td>MARI Adopted With Business Plan Buy-In</td>
<td>4Q09</td>
<td>Research, Education, Tech Transfer</td>
</tr>
<tr>
<td></td>
<td>Establish an Engineering Research Projects Lab (ERPL) to Allocate Reassignable Short-Term Space and Staff to Support Industrial Projects (Assoc Dean Research)</td>
<td>Flexible Space Approved with Staff Support</td>
<td>3Q09</td>
<td>Research, Education, Tech Transfer</td>
</tr>
<tr>
<td></td>
<td>Improve Central Administration Flexibility and Responsiveness for IP Agreements, Contracts and Grants (Assoc Dean)</td>
<td>20% Time Reduction to Get Funds after Grant Awards</td>
<td>4Q09</td>
<td>Research, Education, Tech Transfer</td>
</tr>
<tr>
<td></td>
<td>Develop Cooperative Programs with Industry and Selected Agencies to Support More Undergraduate Research (Assoc Dean)</td>
<td>First Program Established</td>
<td>3Q10</td>
<td>Research, Tech Transfer</td>
</tr>
</tbody>
</table>
Strategic Objectives for Leadership

Establish a Comprehensive Strategy for Increased Funding

Increase External Recognition for Faculty and Students

Recruit and Retain Higher-Quality Students

Establish the MSU Engineering Education Research Institute

Establish the MSU Applied Research Institute

Improve Industrial Collaboration and Entrepreneurship

If the college is to successfully achieve “leadership in technology transfer to benefit society” and support the world-grant vision of the university, efforts must be stepped up to embed a more vibrant entrepreneurial spirit in our culture along with stronger ties to industry. The college has a cutting-edge talent pool that can be better leveraged to encourage more industry-based undergraduate research, to emphasize more the importance of business skills in deploying technology, and to stress the long-term benefits that stronger ties with industry -- through people exchanges, technology fairs, and seminars -- can yield.

As the possible Action Plan summary below suggests, improved industrial collaboration critically depends on a close alliance with the previously recommended MSU Applied Research Institute (MARI), the Engineering Research Project Lab (ERPL), and the MSU Engineering Education Research Institute (MEERI). Successfully addressing this strategic objective only reinforces the interdependency of all the aforementioned actions in addressing all of the KSls over the plan period.

Addressing improved industry collaboration and entrepreneurship will, of necessity, require new ways of doing business with appropriate incentives and workload balancing to be successful.

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</tr>
</thead>
<tbody>
<tr>
<td>Improve Industrial Collaboration and Entrepreneurship</td>
<td>Develop Cooperative Programs with Industry and/or Agencies for UG Research Including Competitions for UG Project Presentations and Load Incentives for Faculty (Assoc Dean Research)</td>
<td>Program Established, First Competition Complete (Coordinate Effort with Michigan Applied Research Institute (MARI))</td>
<td>3Q10</td>
<td>Tech Transfer, Research</td>
</tr>
<tr>
<td></td>
<td>Emphasize Entrepreneurship/Business Skills More for Both Undergraduate and Graduate Students (Assoc Deans, Business School Faculty)</td>
<td>Expanded Program Planned, Implemented Before 2011</td>
<td>4Q10</td>
<td>Tech Transfer, Education</td>
</tr>
<tr>
<td></td>
<td>Facilitate More People-To-People Exchanges with Industry (E.G Sabbaticals) (Dean, Assoc Deans)</td>
<td>Formal Program Adopted Before 2012</td>
<td>4Q11</td>
<td>Tech Transfer, Research</td>
</tr>
<tr>
<td></td>
<td>Promote Technology Fairs in Conjunction with MARI And ERPL, Including Improved Industrial Projects Publicity (Assoc Deans)</td>
<td>Target ‘2’ Technology Fairs Per Year Minimum</td>
<td>Ongoing</td>
<td>Tech Transfer, Research, Education</td>
</tr>
<tr>
<td></td>
<td>Encourage Seminars (Both by Industry and Industry) (MARI Director, MEERI Director, Assoc Deans)</td>
<td>Target ‘1’ Seminar at Industry and ‘1’ Seminar by Industry Per Year Minimum</td>
<td>Ongoing</td>
<td>Tech Transfer, Research, Education</td>
</tr>
<tr>
<td></td>
<td>Provide Internal Recognition for Technology Transfer across the College (Dean, Assoc Deans)</td>
<td>Recognition Program Established, Incentives in Place</td>
<td>4Q09</td>
<td>Tech Transfer</td>
</tr>
</tbody>
</table>
Summary and Next Steps

Summary

The College of Engineering Strategic Plan (ESP) is fundamentally directed at achieving our vision: "To be recognized as an international leader in engineering education, research, and the application of knowledge to benefit society globally." The plan was crafted with the assistance and insight of the team summarized on the verso page.

Going forward, the success of the ESP will critically hinge on the active involvement of the dean, associate deans, department chairs, our faculty and the student body at large. The ESP sets forth a framework for leadership that attempts to help the College of Engineering proactively manage change, promote new ways of doing business, and achieve the vision while honoring our core values and mission.

Next Steps

The verso page summarizes a few broader next steps intended to help the ESP come alive. Commitment, intensity and leadership at all levels will be required in order to achieve meaningful results.

Suggested Next Steps

- Identify specific champions for the six strategic objectives to creatively impact the first one to two years of the plan period.
- Prioritize the strategic objectives and broadly communicate the ESP to all affected College of Engineering personnel.
- Encourage all chairs to align departmental plans with the ESP.
- Encourage the timely completion and implementation of all strategic objective and thought-starter action plans.
- Schedule quarterly reviews (chaired by the dean) to review progress on the priority strategic objectives and action plans (supported by the appropriate metrics).
- Encourage a culture that enthusiastically promotes industrial collaboration, entrepreneurship and new ways of doing business and not merely more of the same.

*Retired Ford executive, MSU BSME/MBA graduate
Strategic Objectives and Action Plans

Legend: R=Research, E=Education, TT=Tech Transfer

Establish a Comprehensive Strategy for Increased Funding

- Increase $/FTE
  - KSI Benefit: R
  - Action Plans: A2
- Increase centers
  - KSI Benefit: R
  - Action Plans: A3
- Increase core investment for research
  - KSI Benefit: R
  - Action Plans: A4
- Graduate funding
  - KSI Benefit: E, R
  - Action Plans: A13
- Undergraduate funding
  - KSI Benefit: E, R
  - Action Plans: A13
- Post-baccalaureate funding
  - KSI Benefit: E
  - Action Plans: A13

Increase External Recognition for Faculty and Students

- Faculty
  - KSI Benefit: R, E
  - Action Plans: A5a
- Students
  - KSI Benefit: R, E
  - Action Plans: A5b
- Image
  - KSI Benefit: R, E
  - Action Plans: A6

Increase Number and Quality of Students

- Domestic Ph.D. Students
  - KSI Benefit: R, E
  - Action Plans: A7
  - Include ‘Intro to Engineering’ for freshmen
  - Integrate PAs into Research Programs
  - Promote joint BS-MS Programs
  - Create graduate summer intern programs
  - Promote accelerated Ph.D. entry
  - Encourage Ph.D. coursework program
  - Recognize completion of comp exam
- Improve Quality/Retention of UG/GR admissions
  - KSI Benefit: E, R
  - Action Plans: A17

Establish Michigan Engineering Education Research Institute

- Seminars (talks by industry, at industry)
  - KSI Benefit: E, TT
  - Action Plans: A15
- Advanced technology workshops
  - KSI Benefit: E
  - Action Plans: A15

Establish the Michigan Applied Research Institute

- Establish the Engineering Research Projects Lab (EIPL)
  - KSI Benefit: R, E, TT
  - Action Plans: A10
- Load Model allowing tech transfer
  - KSI Benefit: TT
  - Action Plans: A10
- Central Administration (e.g. C&G support)
  - KSI Benefit: R, TT
  - Action Plans: A8
- Space Optimization
  - KSI Benefit: R, E, TT
  - Action Plans: A9
- Undergraduate Research
  - KSI Benefit: R, TT
  - Action Plans: A16

Improve Industry Collaboration and Entrepreneurship

- Industrial projects publicity
  - KSI Benefit: TT
  - Action Plans: A15
- People-to-people exchanges (e.g. sabbaticals)
  - KSI Benefit: TT
  - Action Plans: A15
- Faculty development programs
  - KSI Benefit: TT, E
  - Action Plans: A15
- Entrepreneurship in Engrg (UG classes, etc.)
  - KSI Benefit: TT, E
  - Action Plans: A15
- Technology Fairs and Seminars
  - KSI Benefit: TT, E
  - Action Plans: A15
Appendix

Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis……….. A1

Leadership in Research Thought-Starter Action Plans

- Increase External Funding…………………………………………………………A2
- Increase Centers……………………………………………………………………..A3
- Increase Core Investment…………………………………………………………A4
- Increase External Recognition (Faculty, Students)…………. A5a, A5b
- Improve Research Image…………………………………………………………..A6
- Improve Research Culture…………………………………………………………A7
- Improve Research Infrastructure (Central Administration)………A8
- Improve Research Infrastructure (Space)…………………………………..A9
- Establish and Engineering Research Project Lab (ERPL)………. A10
- Establish the MSU Applied Research Institute……………………….A11

Leadership in Education Thought-Starter Action Plans

- Establish the MSU Engineering Education Research Institute ......A12
- Increase Funding for Education………………………………………………….A13
- Increase External Recognition for Education………………..A14a, A14b
- Improve the Education Culture…………………………………………………A15
- Improve Education Infrastructure (Undergraduate Research)……A16
- Improve Education Infrastructure (Core Math/Science)………………A17

ASEE Expenditures ..................................................................................A18

PhD Student Penetration.........................................................................A19
SWOT Analysis

Strengths
- Undergraduate education and residential college
- International experience for undergraduates
- Strategic research centers
- Collaborative activities and opportunities
- Co-location of the engineering faculty
- Success in internal funding with other colleges
- Trends in the last five years
- Improved leadership in the college
- Collaborative opportunities in the College of Agriculture and Natural Resources.

Weaknesses
- Lack of a research hospital (major funding limitation)
- Low ranking of the college
- Decreasing number of graduate students
- Lack of lab space
- Lack of local industry
- Lack of focus from the senior administration
- Need for help with post-award process (better response and organization necessary)
- Need help organizing large centers
- Small college size compared to peers
- Need for more development (endowment, scholarships, fellowships, etc)
- Low proposal submission per faculty (3-4 per year)
- Less state funding than UM and WSU

Opportunities
- Alternative energy
- Sustainable materials
- Homeland security
- Petascale computing
- Auto industry (not just the Big Three, but all the suppliers and others)
- More agricultural extension
- Internet dissemination

Threats
- Shrinking pool of research funds
- Diversity of research funding
- Volume of proposals submitted to NSF is NOT proportional to the opportunity
- Young faculty turnover
- Too many public institutions in Michigan
- Lack of opportunities for early-career faculty
- Increased endowment at other institutions
- Tuition cost increases
**Key Strategic Issue (KSI):** Recognized Leadership in Research

**Champions:** Shanker B., Drzal

**Strategic Objective:** Increase Extramural Funding

**Action Plan Item:** Increase the $/FTE by 10% / year

<table>
<thead>
<tr>
<th>Action Step</th>
<th>Customer(s)/Audience(s)</th>
<th>Start</th>
<th>End</th>
<th>Measureable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Increase proposal success and number of proposals</td>
<td>Faculty, Most funding agencies</td>
<td>4Q08</td>
<td>4Q12</td>
<td>Faculty to agency trips OR agency visits to MSU per quarter</td>
<td>Assoc Dean Research/Dept Chair/Faculty</td>
</tr>
<tr>
<td>a. Introductions to program managers</td>
<td>Faculty</td>
<td>4Q08</td>
<td>4Q12</td>
<td>No of proposals submitted</td>
<td>Faculty; Data-DER</td>
</tr>
<tr>
<td>b. Be responsive to RFPs</td>
<td>Faculty</td>
<td>4Q08</td>
<td>4Q12</td>
<td>No of application/awards</td>
<td>Faculty; Data-DER</td>
</tr>
<tr>
<td>c. Spend time in federal/state/industrial facilities</td>
<td>Faculty, Fed Agency</td>
<td>3Q09</td>
<td>4Q12</td>
<td>No of SBIR/STTR/GOALI proposals/awards</td>
<td>Faculty; Data-DER</td>
</tr>
<tr>
<td>d. Collaboration with gov't labs/industry-SBIR,STTR,State</td>
<td>Industry, Fed Agency, Faculty</td>
<td>1Q09</td>
<td>4Q12</td>
<td>No of proposals with PIs &gt; 1</td>
<td>Faculty; Data-DER</td>
</tr>
<tr>
<td>e. Collaborative proposals outside disciplinary boundaries</td>
<td>Faculty</td>
<td>1Q10</td>
<td>4Q12</td>
<td>1 per Dept per Year</td>
<td>Faculty, Dept Chair</td>
</tr>
<tr>
<td>f. 'Technical Workshop' offerings by faculty</td>
<td>Gov't &amp; Industry</td>
<td>3Q09</td>
<td>4Q12</td>
<td>1 per Dept per Year</td>
<td>Faculty, Dept Chair</td>
</tr>
<tr>
<td>g. 'Short Course' offering</td>
<td>Gov't &amp; Industry</td>
<td>3Q09</td>
<td>4Q12</td>
<td>1 per Dept per Year</td>
<td>Faculty, Dept Chair</td>
</tr>
<tr>
<td>h. 'Testing and Characterization' services</td>
<td>Gov't &amp; Industry</td>
<td>4Q08</td>
<td>4Q12</td>
<td>No. of testing projects per Year</td>
<td>Faculty+Dept</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other):**
- Increase in College extramural research funding
- Increase in External Recognition and Reputation for Research
- Increase in Faculty and Graduate Student Quality
- Better placement of Graduate students
- Increase in Intramural funding for research and infrastructure

**Required Resources ($ and/or manhours):**
- Faculty chair and Dean time;
- Seed funding for workshops and short courses
- Better marketing of faculty members and their research
- Continual help with contracts and grants to facilitate pre- and post-award processing
**Key Strategic Issue (KSI):** Recognized Leadership in Research

**Champions:** Shanker B., Drzal

**Strategic Objective:** Increase Extramural Funding

**Action Plan Item:** Increase Number of Centers – one additional every 3 years & increase in research faculty (5/year)

---

### Action Plan/Action Steps

<table>
<thead>
<tr>
<th>Action Step</th>
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<th>End Date (AQBB)</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify multi-disciplinary working groups</td>
<td>Faculty</td>
<td>4Q09</td>
<td>4Q14</td>
<td>Title &amp; keyword description to DER</td>
<td>Faculty/Chair/Dean</td>
</tr>
<tr>
<td>Develop reward and recognition program</td>
<td>Faculty</td>
<td>1Q09</td>
<td>2Q09</td>
<td>Faculty Buy-in</td>
<td>Chair/Dean</td>
</tr>
<tr>
<td>Identify target resources and three year strategic plan for proposal submission</td>
<td>Dean/Chairs</td>
<td>1Q09</td>
<td>2Q09</td>
<td>No. of three year center development proposals submitted and approved SWOT assessment</td>
<td>Faculty Group; data-DER</td>
</tr>
<tr>
<td>Semi-annual management review of center progress</td>
<td>Dean/DeptChairs</td>
<td>3Q09</td>
<td>4Q14</td>
<td>No. of three year center development proposals submitted and approved SWOT assessment</td>
<td>Assoc Dean/Chairs</td>
</tr>
<tr>
<td>Investment of seed funds to incubate and support the effort</td>
<td>Faculty</td>
<td>3Q09</td>
<td>4Q14</td>
<td>Return on investment/No. of proposals</td>
<td>Dean/Dept Chair</td>
</tr>
<tr>
<td>Participate in multi-disciplinary research initiatives (MURIs)</td>
<td>DoD/DOE</td>
<td>1Q09</td>
<td>4Q14</td>
<td>Annual MURI proposals submitted</td>
<td>Faculty, data-DER</td>
</tr>
</tbody>
</table>

### Expected Benefits ($ and/or other)

- Increase in external funding of research centers
- Increase in external recognition and reputation for research
- Increase in faculty and graduate student quality

### Required Resources ($ and/or manhours)

- Time commitment by faculty
- Dollars from Dean
- Leadership in the administration to form and motivate teams
### Key Strategic Issue (KSI):
Recognized Leadership in Research

### Strategic Objective:
Increase Extramural Funding

### Action Plan Item:
Increase Core Investment

<table>
<thead>
<tr>
<th>Action Step</th>
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<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish <em>Research</em> Professor career track</td>
<td>Postdocs, industry, early retirees, visiting scholars</td>
<td>1Q09</td>
<td>4Q09</td>
<td>Modification of Faculty Handbook and College By-laws</td>
<td>College/University</td>
</tr>
<tr>
<td>Five year internal investment funding of ~$120K/yr/Dept - recruit research professors</td>
<td>Gov’t agencies (DoD, DoE, NASA), industry researchers</td>
<td>3Q09</td>
<td>3Q14</td>
<td>R.O.I. threshold*</td>
<td>Dean/University</td>
</tr>
<tr>
<td>Faculty management plan for sabbaticals</td>
<td>Peer institutions, AFRL, ARL, Research Labs, Industries</td>
<td>1Q09</td>
<td>2Q09</td>
<td>Dept plans submitted and updated annually</td>
<td>Chairs/Faculty</td>
</tr>
</tbody>
</table>

*Asst Res Prof 100% cost in 4 years
*Assoc Res Prof 150% cost in 4 years
*Research Prof 200% cost in 4 years

### Expected Benefits ($ and/or other)
- Increase in external recognition and reputation for research
- Increase in faculty and graduate student quality

### Required Resources ($ and/or manhours)
- $720K/year college investment
**Key Strategic Issue (KSI):** Recognized Leadership in Research

**Champions:** Harichandran, Steffe

**Strategic Objective:** Increase External Recognition

**Action Plan Item:** Faculty

<table>
<thead>
<tr>
<th>Action Plan Item</th>
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<th>Start Date (XQYY)</th>
<th>End Date (AQBB)</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase publications in top-tier journals</td>
<td>External Deans, Chairs, Faculty, and Industry</td>
<td>1Q09</td>
<td>4Q12</td>
<td>Rank in the top quartile of peer institutions for journal pubs./FTE</td>
<td>Faculty, Chairs, Dean</td>
</tr>
<tr>
<td>- Identify top tier journals by disciplinary area</td>
<td></td>
<td>1Q09</td>
<td>1Q09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Establish publication counts per FTE of MSU COE and COE at peer institutions</td>
<td></td>
<td>2Q09</td>
<td>2Q09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Create incentives to motivate our faculty to increase publications in top-tier journals</td>
<td></td>
<td>1Q09</td>
<td>2Q09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase presentations at and partnerships with top tier universities</td>
<td>External Deans, Chairs, Faculty, and Industry</td>
<td>1Q09</td>
<td>1Q12</td>
<td>5% annual growth rate in presentations; 5% annual growth rate for publications in top tier journals</td>
<td>Faculty, Chairs, Dean</td>
</tr>
<tr>
<td>Increase fellows of professional societies</td>
<td>Society members, and external Deans &amp; Chairs</td>
<td>4Q08</td>
<td>4Q12</td>
<td>Rank in the top quartile of peer institutions for number of fellows</td>
<td>Faculty, Chairs, Dean</td>
</tr>
<tr>
<td>Increase external awards, honors &amp; keynote presentations at conferences</td>
<td>External Deans, Chairs, Faculty, and industry</td>
<td>4Q09</td>
<td>4Q12</td>
<td>Rank in the top quartile of peer institutions for number of awards, honors and keynotes per FTE</td>
<td>Faculty, Chairs, Dean</td>
</tr>
<tr>
<td>- Increase number of nominations for external awards/honors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**

Increased visibility of faculty at top tier universities, professional societies and industry.

**Required Resources ($ and/or manhours)**

Time of graduate students, faculty, chairs and Dean (with support staff). Financial incentives.
**Key Strategic Issue (KSI):** Recognized Leadership in Research  
**Champions:** Harichandran, Steffe

**Strategic Objective:** Increase External Recognition  
**Action Plan Item:** Students

<table>
<thead>
<tr>
<th>Action Step</th>
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<th>End Date</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase student journal paper submissions, paper presentations at prominent conferences, and student paper awards</td>
<td>External chairs, industry, present and future faculty</td>
<td>4Q08</td>
<td>4Q12</td>
<td>Demonstrate steady growth rising to target of 100% of PhD students and 50% of MS thesis students over program</td>
<td>Students, faculty</td>
</tr>
<tr>
<td>- Facilitate students to present at prominent conferences</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- Encourage students to submit papers for awards</td>
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<td></td>
</tr>
<tr>
<td>- Require journal paper submission before graduation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase external scholarships and fellowships won by students</td>
<td>External chairs, industry, present and future faculty</td>
<td>4Q08</td>
<td>4Q12</td>
<td>Demonstrate steady growth rising to target of 20% of graduate students</td>
<td>Students, faculty</td>
</tr>
<tr>
<td>- Increase number of nominations of students for external scholarships and fellowships</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place PhD students as faculty at U.S. universities ranked above MSU, and at top tier universities abroad</td>
<td>External deans, chairs, faculty</td>
<td>4Q09</td>
<td>4Q12</td>
<td>Appropriate metric to be defined</td>
<td>Faculty, chairs</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**  
Increased visibility of graduate students to top tier universities, professional societies and industry

**Required Resources ($ and/or manhours)**  
Time of graduate students, and faculty.  
Funds for student travel.
Key Strategic Issue (KSI): Recognized Leadership in Research

Champions: Harichandran, Steffe

Strategic Objective: Increase External Recognition

Action Plan Item: Improve Research Image

<table>
<thead>
<tr>
<th>Action Step</th>
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<th>End Date</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase the effectiveness of external publicity of research</td>
<td>External deans, chairs, faculty, alumni, industry</td>
<td>4Q08</td>
<td>4Q12</td>
<td>10% annual growth rate of publications in selective forums</td>
<td>Dean, Chairs, faculty, publications/marketing staff</td>
</tr>
</tbody>
</table>

Expected Benefits ($ and/or other)

Improve research image

Required Resources ($ and/or manhours)

Time of Dean, Chairs, faculty and publications/marketing staff. Funds for publications.
### Key Strategic Issue (KSI):
Recognized Leadership in Research

### Strategic Objective:
Improve Research Culture

### Action Plan Item:
Improve Student Research Culture

<table>
<thead>
<tr>
<th>Action Step</th>
<th>Customer(s)/Audience(s)</th>
<th>Start Date (QYY)</th>
<th>End Date (QYY)</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Include “Introduction to MSU Engineering Research” as part of the new freshman course</td>
<td>Engineering freshmen</td>
<td>1Q09</td>
<td>3Q09</td>
<td>UG research participation</td>
<td>EGR 100 Course</td>
</tr>
<tr>
<td>2) Integrate Professorial Assistant program into research programs</td>
<td>Engineering PA’s</td>
<td>3Q09</td>
<td>1Q10</td>
<td>PA research participation</td>
<td>Undergraduate Studies</td>
</tr>
<tr>
<td>3) Promote Engineering joint B.S. – M.S. Programs including</td>
<td>Engineering juniors and seniors</td>
<td>3Q09</td>
<td>3Q10</td>
<td>BS-MS program participation</td>
<td>Dept Graduate Coord</td>
</tr>
<tr>
<td>a) an integrated M.S. thesis program,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) junior and senior paid research aide positions and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Summer Undergraduate Research Internship each summer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Create Graduate Summer Research Internships for May graduates</td>
<td>New engineering Graduate students</td>
<td>1Q09</td>
<td>3Q09</td>
<td>Retention of highest quality students</td>
<td>Spartan Engineering</td>
</tr>
<tr>
<td>admitted into graduate programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Promote engineering accelerated Ph.D. entry program</td>
<td>Highest quality engineering MS students</td>
<td>1Q09</td>
<td>4Q10</td>
<td>Program participation</td>
<td>Dept graduate coordinators</td>
</tr>
<tr>
<td>6) Encourage coursework requirements for PhD students</td>
<td>Engineering PhD students</td>
<td>1Q09</td>
<td>4Q10</td>
<td>Graduate course enrollment</td>
<td>Dept graduate coordinators</td>
</tr>
<tr>
<td>7) Recognize completion of comprehensive examination w/ advancement to candidacy</td>
<td>Engineering PhD students</td>
<td>1Q09</td>
<td>4Q10</td>
<td>Mean time to comprehensive exam</td>
<td>Dean's office</td>
</tr>
</tbody>
</table>

### Expected Benefits ($ and/or other)
Better recruitment of high quality students into MSU engineering programs
Better recruitment of high quality MSU engineering students into graduate programs
Better recruitment of high quality MSU engineering MS students into PhD programs
Better recruitment of high quality MSU engineering MS students into PhD programs
Higher quality PhD programs and increased graduate course offerings (Item 6)

### Required Resources ($ and/or manhours)
Additional funds for PA’s
Additional funds for Undergraduate Summer Research interns
Additional funds for Graduate Summer Research interns
### Key Strategic Issue (KSI):
Recognized Leadership in Research

### Champions:
Jayaraman, Biswas

### Strategic Objective:
Improve Infrastructure Flexibility and Responsiveness

### Action Plan Item:
Central Administration

<table>
<thead>
<tr>
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<th>End Date (AQBB)</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Institute time table for follow-up of disclosures in IP office</td>
<td>Faculty</td>
<td>1Q09</td>
<td>2Q09</td>
<td>Timetable endorsed</td>
<td>Assoc. Dean, IP Office</td>
</tr>
<tr>
<td>2. Institute time table for IP agreements with industry in IP office</td>
<td>Faculty</td>
<td>1Q09</td>
<td>2Q09</td>
<td>Timetable endorsed</td>
<td>Assoc. Dean, IP Office</td>
</tr>
<tr>
<td><strong>Contracts and Grants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Improve responsiveness of CGA to demands of grantors</td>
<td>Faculty</td>
<td>2Q09</td>
<td>4Q09</td>
<td>20% time reduction to get the funds after award</td>
<td>Assoc. Dean</td>
</tr>
<tr>
<td>2. Allow rental costs of space to be free of indirect costs and make it a separate category</td>
<td>Faculty</td>
<td>4Q08</td>
<td>1Q09</td>
<td>more options for space</td>
<td>Assoc. Dean</td>
</tr>
</tbody>
</table>
### Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leadership in Research

**Strategic Objective:** Improve Infrastructure Flexibility and Responsiveness

**Action Plan Item:** Space

<table>
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<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Estimate space needs formally with the announcement of every position</td>
<td>New hires and existing faculty</td>
<td></td>
<td></td>
<td>30% reduction in space allocation after new hire arrives</td>
<td>Assoc. Dean for Research</td>
</tr>
<tr>
<td>2. Provide additional space that is required for short-term projects with a short planning cycle</td>
<td>Faculty</td>
<td></td>
<td></td>
<td>20% improvement in short-term project space allocation</td>
<td>Assoc. Dean for Research</td>
</tr>
<tr>
<td>3. Evaluate utilization of space periodically in terms of funding and productivity</td>
<td>Faculty</td>
<td></td>
<td></td>
<td>Students supported over 3 years /sq ft</td>
<td>Assoc. Dean for Research</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**

Better utilization of limited resources
**Key Strategic Issue (KSI):** Recognized Leadership in Research  

**Champions:** Jayaraman, Biswas

**Strategic Objective:** Improve Infrastructure Flexibility and Responsiveness

**Action Plan Item:** Infrastructure for Engineering Research Projects Laboratory (ERPL)

<table>
<thead>
<tr>
<th>Action Step</th>
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<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| Allocate reassignable short-term space and staff for engineering research projects Laboratory  
  a. Facilitate quick set-up of specific equipment in additional short term space  
  b. Provide a pool of researchers/technicians for short-term assignments | Faculty                 | 1Q09              | 3Q09           |               | Assoc Dean for research |

**Expected Benefits ($ and/or other)**

We can capitalize on opportunities that will lead to long term beneficial relationships

**Required Resources ($ and/or manhours)**

Identify space equivalent to 5% of currently available space for this purpose
**Action Plan/Action Steps**

**Key Strategic Issue (KSI):** Recognized Leadership in Research

**Strategic Objective:** Improve Infrastructure Flexibility and Responsiveness

**Action Plan Item:** Establish MSU Applied Research Institute (MARI)

<table>
<thead>
<tr>
<th>Customer(s)/ Audience(s)</th>
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<th>End Date (AQBB)</th>
<th>Measurable(s)</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry and other applied research customers</td>
<td>1Q09</td>
<td>2Q10</td>
<td>Institute adopted</td>
<td>Assoc Dean for Research, selected faculty</td>
</tr>
<tr>
<td>Feedback from external organizations</td>
<td>2Q09</td>
<td></td>
<td></td>
<td>Assoc Dean for Research, selected faculty</td>
</tr>
<tr>
<td>Amount of support and thrust</td>
<td>3Q09</td>
<td></td>
<td></td>
<td>Assoc Dean for Research, selected faculty</td>
</tr>
<tr>
<td>Major thrust area business plan buy-in</td>
<td>3Q09</td>
<td>4Q09</td>
<td>Capital required identified</td>
<td>Dean, Assoc Dean Core group</td>
</tr>
<tr>
<td>Capacity established base on number of projects</td>
<td>1Q10</td>
<td></td>
<td></td>
<td>Core group</td>
</tr>
<tr>
<td>Expanded capacity and recognition</td>
<td>2Q10</td>
<td></td>
<td></td>
<td>Core group</td>
</tr>
</tbody>
</table>

**Champions:** Jayaraman, Biswas

**Expected Benefits ($ and/or other):**
- More on-going connections between graduates and university
- More varied research opportunities
- Increased funding from industry and DOD
- More opportunities for PhD graduate placement
- Facilitates Technology Transfer to benefit society
### Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leadership in Education  
**Champions:** Chatti, Harichandran, Steffe

**Strategic Objective:** Establish an MSU Engineering Education Research Institute (MEERI)  
**Action Plan Item:** Develop and Propose Plan for MEERI

<table>
<thead>
<tr>
<th>Action Step</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Identify working group and leader (including CoE champions and CoEd faculty interested in collaboration)</td>
<td>Faculty (both CoE and CoEd)</td>
<td>1Q09</td>
<td>2Q09</td>
<td>Working group established with CoE and CoEd faculty buy-in</td>
<td>Assoc Deans, affected faculty</td>
</tr>
<tr>
<td>Identify potential partners outside MSU</td>
<td>Industry partners, non-profit education institutions, faculty outside MSU</td>
<td>2Q09</td>
<td>3Q09</td>
<td>Target audience agreement</td>
<td>Working Group</td>
</tr>
<tr>
<td>Develop internal strategy for 'seed' funding</td>
<td>MSU central administration, MSU Foundation</td>
<td>2Q09</td>
<td>3Q09</td>
<td>Seed funding approved</td>
<td>Working Group</td>
</tr>
<tr>
<td>Identify external funding sources (including CPACE, other NSF grants)</td>
<td>Department of Education, NSF, foundations and non-profit organizations, industry</td>
<td>4Q09</td>
<td>1Q10</td>
<td>External funding identified</td>
<td>Working Group</td>
</tr>
<tr>
<td>Develop, refine concept, propose MEERI plan including: Funding, External Recognition, Culture and Infrastructure</td>
<td>Department of Education, NSF, foundations and non-profit organizations, industry</td>
<td>2Q09</td>
<td>4Q09</td>
<td>Plan Approved and funded, EERI Director named</td>
<td>Working Group</td>
</tr>
</tbody>
</table>

**memo:** Use ESP Team thought starter Action Plans as resource

<table>
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</thead>
<tbody>
<tr>
<td>Publicly announce MEERI</td>
<td>Faculty, students, industry, agencies, public</td>
<td>1Q10</td>
<td>Media acknowledges</td>
<td>Deans, MEERI Director</td>
<td></td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**

MEERI would foster innovative methods and new educational structures (courses, interaction, dissemination) generating a new culture of Engineering education. Furthermore, the Institute would provide linkage to other units within the University including both business and education. The result would be both better quality students and give them an opportunity for lifelong contact with MSU.
Action Plan/Action Steps

Key Strategic Issue (KSI): Recognized Leadership in Education

Champions: Shanker B., Drzal

Strategic Objective: Funding for Education

Action Plan Item: Increase Funding for Education

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Increase Graduate Scholarships</td>
<td>Graduate students</td>
<td>1Q09</td>
<td>1Q14</td>
<td>10% annual funding growth rate</td>
<td>Assoc Deans</td>
</tr>
<tr>
<td>1. Funding for underrepresented groups (minorities, women and domestic students)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Capital Campaign funding sources</td>
<td></td>
<td></td>
<td></td>
<td>5% year-over-year funding increase</td>
<td>Dean, Central Administration Chairs</td>
</tr>
<tr>
<td>3. Industrial sponsored funding (fellowships, gifts, and short-term internships)</td>
<td></td>
<td></td>
<td></td>
<td>Secure one additional industry funding source/year/dept</td>
<td>Chairs</td>
</tr>
</tbody>
</table>

Increase Undergraduate Funding

Undergrad students 1Q10 1Q13

<table>
<thead>
<tr>
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<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Residential College</td>
<td></td>
<td></td>
<td></td>
<td>5% annual funding growth rate</td>
<td>Residential College Director</td>
</tr>
<tr>
<td>2. Division of Undergraduate Education in NSF</td>
<td></td>
<td></td>
<td></td>
<td>Source established</td>
<td>Selected faculty</td>
</tr>
<tr>
<td>3. NSF REU</td>
<td></td>
<td></td>
<td></td>
<td>Source established</td>
<td>Selected faculty</td>
</tr>
<tr>
<td>4. Short-term Industrial Internships</td>
<td></td>
<td></td>
<td></td>
<td>Source established</td>
<td>Selected faculty</td>
</tr>
</tbody>
</table>

Enhance Post-Baccalaureate Funding Opportunities

Working Engr grads 4Q10 4Q14

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1. State funding for Lifelong Learning</td>
<td></td>
<td></td>
<td></td>
<td>Source established</td>
<td>Assoc Deans, selected faculty</td>
</tr>
<tr>
<td>2. Industrial sponsorships</td>
<td></td>
<td></td>
<td></td>
<td>Secure one additional industry funding source/year/dept</td>
<td>Assoc Deans, selected faculty</td>
</tr>
</tbody>
</table>

Expected Benefits ($ and/or other)

Establishes better focus on funding underrepresented graduate groups
Leverages NSF interest in funding undergraduate programs
Strengthens connections with working graduate MSU engineers and industry
## Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leadership in Education  
**Champions:** Chatti, Harichandran, Steffe

### Strategic Objective: Increase External Recognition

#### Action Plan Item: Develop Specific Plans for Faculty, Students and Education Image

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<tr>
<th>Customer(s)/ Audience(s)</th>
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</thead>
<tbody>
<tr>
<td><strong>Faculty</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Increase partnerships with College of Education faculty and others at top tier institutions to secure high profile education related grants that lead to exposure at the national level</td>
<td>General public, media, external Deans, Chairs, faculty</td>
<td>Ongoing</td>
<td>Ongoing 5% annual growth rate in grants, partnerships</td>
<td>Key faculty, Chairs, Dean</td>
</tr>
<tr>
<td>2. Increase publications in engineering education (ASEE journal)</td>
<td>External Deans, Chairs, faculty</td>
<td>Ongoing</td>
<td>Top quartile ranking among peer institutions in journal publications/FTE</td>
<td>Key faculty, Chairs, Dean</td>
</tr>
<tr>
<td>3. Increase keynote presentations at ASEE conferences</td>
<td>ASEE members, external Deans, Chairs, and faculty</td>
<td>Ongoing</td>
<td>Top quartile ranking among peer institutions for keynotes/FTE</td>
<td>Key faculty, Chairs, Dean</td>
</tr>
<tr>
<td>4. Increase development of and partnerships in education-related workshops and seminars</td>
<td>External faculty, Chairs, and Deans</td>
<td>1Q09</td>
<td>3Q09 5% growth rate in presentations, partnerships</td>
<td>Key faculty, Chairs, Dean</td>
</tr>
<tr>
<td>5. Increase development of 'Web-based' public lectures and seminars</td>
<td>General MSU undergraduate students, students outside MSU, external faculty, Chairs, and Deans</td>
<td>1Q10</td>
<td>1Q11 Complete at least one web-series, web attendance by 4Q11</td>
<td>Key faculty, Chairs, Dean</td>
</tr>
<tr>
<td>6. a) Integrate undergraduate research with education through Professorial Assistant programs; b) Develop/increase undergraduate research opportunities through NSF REU, Centers, and summer internships</td>
<td>Students outside MSU, MSU undergrad students, external faculty, industry, chairs, and Deans</td>
<td>2Q09</td>
<td>2Q10 Develop minimum of one Center,10% growth rate in summer internships</td>
<td>Key faculty, Chairs, Dean</td>
</tr>
<tr>
<td>7. Encourage faculty to publish more textbooks (need better faculty incentives)</td>
<td>Students outside MSU, MSU undergrad students</td>
<td>Ongoing</td>
<td>5% per annum growth rate in textbook publications</td>
<td>Faculty, Dean</td>
</tr>
</tbody>
</table>
# Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leadership in Education  
**Champions:** Chatti, Harichandran, Steffe

**Strategic Objective:** Increase External Recognition  
**Action Plan Item:** Develop Specific Plans for Faculty, Students and Education Image

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<tbody>
<tr>
<td><strong>Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Increase graduate/undergraduate student participation in education-related journal submissions, presentations at ASEE conferences, and student paper awards</td>
<td>External chairs, industry, present and future faculty</td>
<td>1Q09</td>
<td>1Q14</td>
<td>5-year target of 50% PhD, 25% MS and 10% Undergraduate student participation</td>
<td>Students, faculty</td>
</tr>
<tr>
<td>2. Increase external scholarships and fellowships</td>
<td>External chairs, industry, present and future faculty</td>
<td>2Q09</td>
<td>2Q14</td>
<td>5-year target of 20% graduate student receiving awards</td>
<td>Students, faculty</td>
</tr>
<tr>
<td>3. Place PhD students as faculty at U.S. teaching colleges and top-tier universities abroad</td>
<td>External Deans, chairs, faculty</td>
<td>2Q09</td>
<td>2Q11</td>
<td>5% increase in two years</td>
<td>Faculty, Chairs</td>
</tr>
<tr>
<td><strong>Image</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Further develop Engineering Residential College in terms of participation and retention</td>
<td>Students, external Deans, chairs, faculty</td>
<td>On-going</td>
<td>On-going</td>
<td>% Engineering student participation</td>
<td>Associate Dean, Director and staff</td>
</tr>
<tr>
<td>2. Increase effectiveness of external publicity and marketing of education programs</td>
<td>External Deans, chairs, faculty, industry</td>
<td>1Q09</td>
<td>2Q09</td>
<td>10% annual growth rate in publications to 'best leverage' sources</td>
<td>Dean, Chairs, faculty, publications staff</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**  
Increased visibility of faculty, student initiatives in education  
Increased visibility of graduate students to teaching colleges, top tier universities, professional societies and industry  
Improved education image

**Required Resources ($ and/or manhours)**  
Time of key education scholars within COE, graduate, undergraduate students, faculty, chairs and Dean (with support staff).  
Financial incentives. Funds for student travel. Funds for publications.
### Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leadership in Education

**Strategic Objective:** Improve Educational Culture

**Action Plan Item:** Develop Specific Plans to Enhance the CoE Educational Culture

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<tbody>
<tr>
<td>Develop <strong>Advanced Technology Workshops</strong> to share and apply developing engineering concepts and methods</td>
<td>MSU graduates, industry</td>
<td>1Q09</td>
<td>4Q14</td>
<td>2 workshops per year minimum</td>
<td>Selected faculty</td>
</tr>
<tr>
<td>Create <strong>Faculty Development Programs</strong> to aid junior faculty with teaching skills and delivery methods</td>
<td>Junior faculty</td>
<td>3Q09</td>
<td>4Q10</td>
<td>Program implemented no later than 2010</td>
<td>Assoc. Deans, selected faculty</td>
</tr>
<tr>
<td>Emphasize <strong>Entrepreneurship/Business skills</strong> for both undergraduate and graduate students</td>
<td>Students</td>
<td>4Q09</td>
<td>4Q10</td>
<td>Expanded program planned, implemented before 2011</td>
<td>Assoc. Deans, Business School</td>
</tr>
<tr>
<td>Improve <strong>Quality of Student Admissions and Connections for Retention</strong> (Grad, Undergrad)</td>
<td>Students</td>
<td>4Q09</td>
<td>4Q11</td>
<td>20% ACT score improvement admitting scores by 2011, 5% retention improvement year over year</td>
<td>Assoc. Dean, Director of Residential College</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**
- Better linkages with industry and MSU graduate engineers
- Enhanced skills transfer to junior faculty
- Better appreciation for business skills to enhance business new technology start-ups
### Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leader in Education

**Champions:** Jayaraman, Biswas

**Strategic Objective:** Improve Infrastructure for Education

**Action Plan Item:** Undergraduate Research

<table>
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<tbody>
<tr>
<td>Develop cooperative program with industry or agencies for undergraduate research</td>
<td>UG students</td>
<td>2Q09</td>
<td>3Q10</td>
<td>Program established/first competition complete</td>
<td>Assoc. Dean of Research</td>
</tr>
<tr>
<td>a. Provide expanded choices to undergraduates for projects</td>
<td>UG students</td>
<td>3Q09</td>
<td>2Q10</td>
<td>Quality of student papers</td>
<td>Assoc. Dean of Research</td>
</tr>
<tr>
<td>b. Recruit companies for participating in UG research projects</td>
<td>UG students</td>
<td>2Q09</td>
<td>1Q10</td>
<td>5% increase/year</td>
<td>Assoc. Dean of Research</td>
</tr>
<tr>
<td>c. Run competitions for UG research project presentations</td>
<td>UG students</td>
<td>1Q10</td>
<td>3Q10</td>
<td>Quality of student papers</td>
<td>Assoc. Dean of Research</td>
</tr>
<tr>
<td>d. Provide load incentives to faculty for UG research projects</td>
<td>Faculty</td>
<td>2Q09</td>
<td>1Q10</td>
<td>Load incentives established</td>
<td>Dean, Assoc. Dean of Research</td>
</tr>
<tr>
<td>e. Encourage publications by undergraduates</td>
<td>UG students</td>
<td>Ongoing</td>
<td>Ongoing</td>
<td>5% increase/year</td>
<td>Assoc. Dean of Research</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**

- Greatly enhance the undergraduate learning experience
- Give industry early evaluation of student potential for employment potential
### Action Plan/Action Steps

**Key Strategic Issue (KSI):** Recognized Leadership in Education  
**Champions:** Jayaraman, Biswas

**Strategic Objective:** Improve Educational Infrastructure and Responsiveness  
**Action Plan Item:** Improve retention/application of core Math/Science requirements

<table>
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</thead>
<tbody>
<tr>
<td>1. Evaluate retention of required math/science content</td>
<td>UG students</td>
<td></td>
<td></td>
<td>Development of metric</td>
<td>Assoc. Dean, selected faculty</td>
</tr>
<tr>
<td>2. Develop a plan for improving retention and application skill</td>
<td>UG students</td>
<td></td>
<td></td>
<td>Adopt plan</td>
<td>Dean</td>
</tr>
<tr>
<td>3. Implement the plan</td>
<td>UG students</td>
<td></td>
<td></td>
<td>New value of metric</td>
<td>Assoc. Deans</td>
</tr>
</tbody>
</table>

**Expected Benefits ($ and/or other)**

- Enhance retention of core math/science content for later application
- Improve communications with MSU math and science departments
- Strengthen Engineering faculty dialogue with freshmen and sophomores
PhD Student Penetration in the College of Engineering

% Foreign PhD vs. US News Ranking
(2007 ASEE Data for Big10+ Universities)