4-15-2015

MTTI Annual Report FY14

Michigan Tech Transportation Institute, Michigan Technological University

MTTI Annual Report FY14

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To: Dave Reed, Vice President of Research

April 15, 2015

Michigan Tech
Transportation Institute

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The Year in Review

After stabilizing leadership of the Michigan Tech Transportation Institute (MTTI) in FY13, the Director and Executive Committee (EC) worked to develop a future path for MTTI and provided strategic goals for further development of the Institute. These goals, as reported to VPR Dave Reed in the MTTI FY2013 annual report, included:

- Continued support of MTTI membership and research activities
- Increase MTTI multi-disciplinary membership
- Expansion of ITS presences
- Continuing education
- Support of educational programs
- Increase initiative funding
- Tech transfer

In review, the goals stated have been realized in some form with the exception of continuing education for professional engineers (PE). The state of Michigan has set some guidelines for continuing education requirements with renewals of 2014 licenses requiring continuing education hours (CEH) in 2016. The goal of providing continuing education is one the Director and Executive Committee will continue to investigate and discuss in this fiscal year.

Seven multi-disciplinary applications for major initiative funding were received, reviewed and awarded for those proposals successful in meeting the vision and mission of MTTI. Major initiative funding for 2014 amounted to $70,000.

Support of membership continued with funding for travel, education and outreach, and for matching funds in proposals with required cost share commitments. MTTI sponsored an expansion of facilities for the Center for Technology & Training (CTT) in their purchase of office furniture and for tech transfer funding to the Rail Transportation Program (RTP) for upgrades to their website.

The Executive Committee remains unchanged as general elections for new members will be held in spring 2015 for one principal member and one affiliate member. The current committee is composed of:

Principal Members – Chair Tim Colling (CTT), Amlan Mukherjee (CEE) and Pasi Lautala (CEE)

Affiliate Members – Vice Chair Colin Brooks (MTRI) and Andrew Swartz (CEE)

For the past year, the Center for Technology and Training (CTT) has been centered in the Department of Civil and Environmental Engineering (CEE) rather than MTTI. Although all proposals are noted with MTTI as the Institute, reporting has been changed to reflect CTT proposals as generated through the CEE Department instead of MTTI as a department.

Mission

"The Michigan Tech Transportation Institute will provide the operating structure, resources, recognition and leadership, in a collaborative environment, that supports research, education and outreach leading to sustainable solutions for transportation."

As stated, the Institute continues to provide resources and structure for collaborative research. Major initiative proposals were received by researchers from Civil and Environmental Engineering (CEE), Mechanical Engineering – Engineering Mechanics (ME-EM), Cognitive and Learning Sciences (CLS), Geological and Mining Engineering & Sciences (GMES), Keweenaw Research Center (KRC), Facilities Management, Great Lakes Research Center (GLRC) and the Michigan Tech Research Institute (MTRI). Major initiatives are those which further the mission of MTTI in new areas of transportation research or in support of already successful programs. Funding was also provided to the Center for Technology and Training (CTT), the Rail Transportation Program (RTP) and numerous individual MTTI members.

A goal of the Director and Executive Committee in FY15 is to expand MTTI beyond the traditional areas of 'transportation' research, increasing membership beyond the current list from the fields of:

Biological Sciences, (BS) Biomedical Engineering (BME), Business and Economics (SBES), Civil and Environmental Engineering (CEE), Computer Science (CS), Cognitive and Learning Sciences (CLS), Chemistry (CH), Electrical and Computer Engineering (ECE), Facilities Management, Geological and Mining Engineering and Sciences (GMES), Materials Sciences and Engineering (MSE), Mathematical Sciences (MS), and Mechanical Engineering and Engineering Mechanics (ME-EM).

MTTI membership is available to all Michigan Tech faculty and staff involved in or pursuing activities in transportation related fields.

Also involved in education and research through MTTI are the partnering programs and centers: Center for Technology & Training (CTT), Tribal Technical Assistance Program (TTAP), Rail Transportation Program (RTP), Center for Science and Environmental Outreach (CSEO), Keweenaw Research Center (KRC) and the Michigan Tech Research Institute (MTRI).

Already in 2015, MTTI has extended an invitation of the Departments of Forestry and Social Sciences for collaboration on proposals and has provided support to the Engineering Fundamentals Department, in support of the MTTI mission.

Use of IRAD Funds

MTTI is allocated Institutional Research and Development (IRAD) funds by the Office of the Vice President for Research, used for MTTI operating expenses and for strategic investment. MTTI IRAD returns (Figure 1), expenditures (Figure 2) and balances (Figure 3) are depicted over a five year period from FY10 through FY14.*

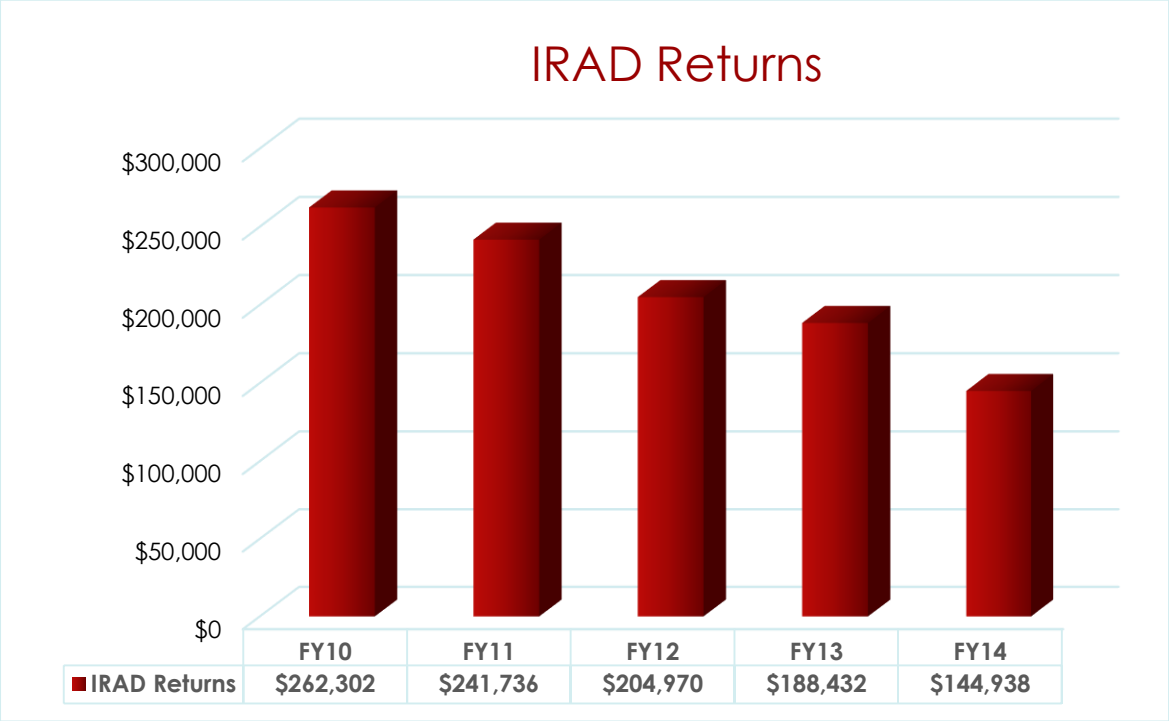


FIGURE 1: IRAD RETURNS

*Several changes in the structure of MTTI have skewed the five year picture of IRAD returns to the Institute. Previously, under then Director Larry Sutter, MTTI was considered both an Institute and a Department. As such, Department (10%) and College/Dean (10%) incentive funds were deposited into the MTTI operating index (E35881) and then reallocated to Sutter's individual PI incentive index (E35899), which depicted higher total IRAD returns to MTTI annually. Upon Sutter's departure, the practice was discontinued and MTTI IRAD totals show only those that are normally associated with a center/institute under the VPR (20%).

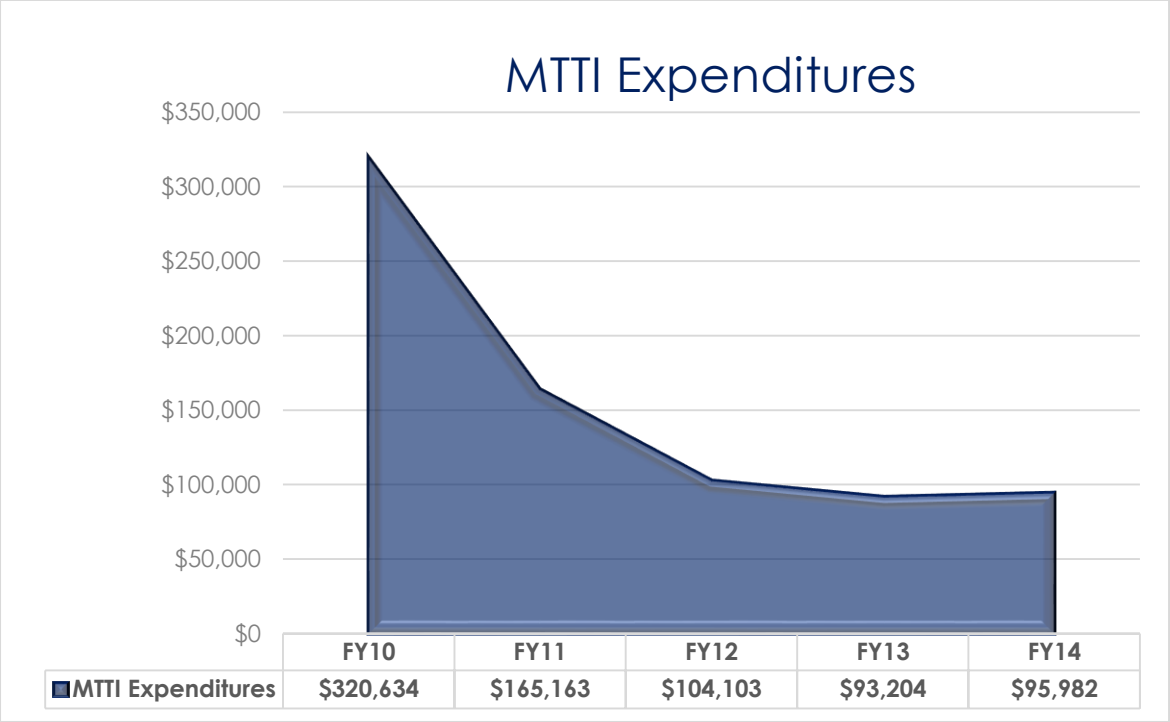


FIGURE 2: MTTI EXPENDITURES

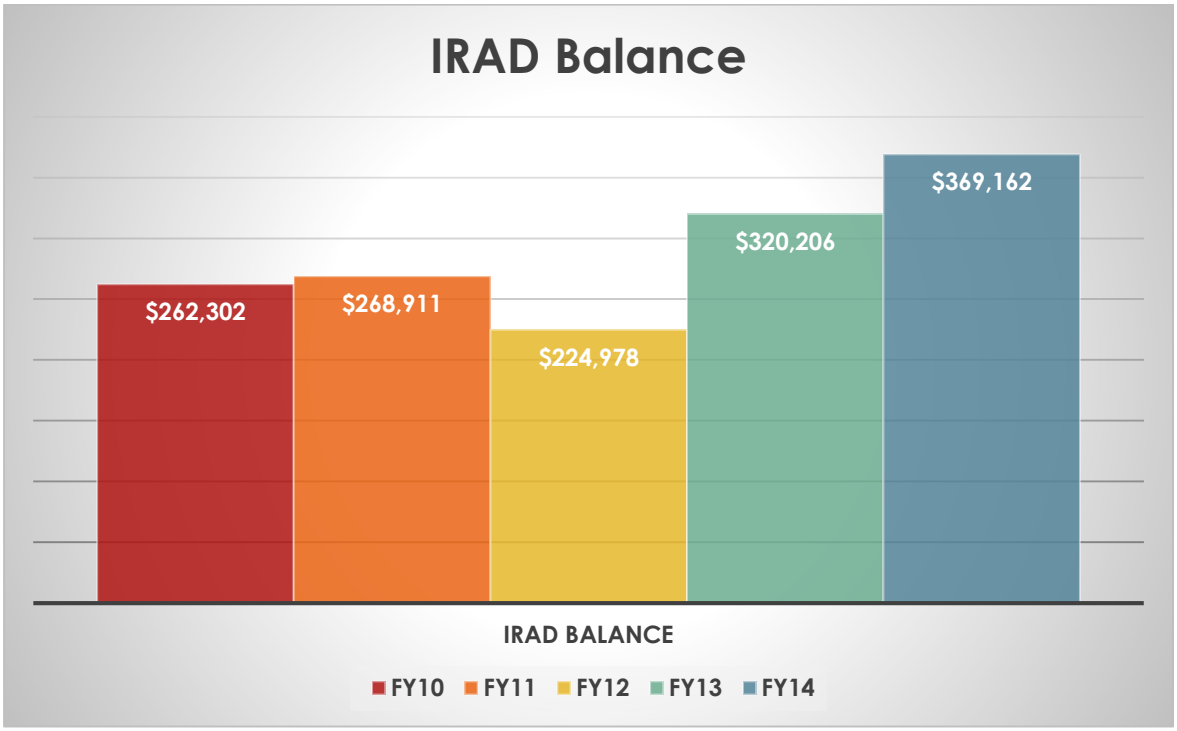


FIGURE 3: IRAD BALANCE

MTTI expenditures improved slightly (Figure 2) over the previous year due to an increased effort in providing MTTI members with opportunities for funding from earned IRAD.

Expenditures are expected to increase and the MTTI IRAD balance (Figure 3) decrease in the future as well, with several major initiative funded projects approved by the EC.

Return on Investment

A goal of the Director and Executive Committee, following a review of FY13 activities, was to strategically use MTTI resources to foster new programs with novel ideas and to support opportunities for growth in existing programs.

An invitation to submit ideas for initiative funding was sent to all MTTI principal, affiliate and friend members in May 2014 following a MTTI informational general meeting. (MTTI membership is defined in the MTTI Charter and Bylaws as approved in 2010.) A limitation of $60,000 per project over multiple years was set by the EC.

Guidelines and definition of what constitutes a 'major initiative' versus a 'project' were drafted by the Executive Committee in response to numerous incomplete submissions. Also drafted by the EC was an example of a currently successful MTTI funded initiative for use by the PIs. Copies of the major initiative guidelines and example documents are included in Appendices B&C.

Several multidisciplinary applications for funding were received and reviewed by the Director and Executive Committee. Outcomes of the proposal submissions follow.

MAJOR INITIATIVES

- Ossama Abdelkhalik, Assistant Professor in the Mechanical Engineering & Engineering Mechanics Department (MEEM), submitted a proposal titled "*Novel Optimization Algorithms for Oversaturated Traffic Network Coordination*" which was approved for funding in the amount of **$5,000**. A condition of the award, Adelkhalik must also provide matching funds in support of this one year project.

- Civil & Environmental Engineering (CEE) Associate Professor, Amlan Mukherjee, was awarded first year funding (of a two year project) in the amount of **$35,000**. Mukherjee's project "*Exploring the Science of Sustainability: Robustness and Resilience of Coupled Infrastructure and Natural Networks*" seeks to develop guidelines for agency stakeholders and decision makers who are currently prioritizing sustainability in their decision-making processes. Deliverables, set by the EC, include three peer reviewed interdisciplinary papers, five to seven collaborative proposals, a conference hosted at the end of year one showcasing research and education efforts and evidence of continued and sustained funding for the initiative from outside sources. Upon successful completion of the project deliverables, Mukherjee is eligible for year two funding in the amount of **$25,000**.

- Assistant Professors Zhen (Leo) Liu and Qingli (Barbara) Dai collaborated on an initiative funding proposal for "*Development of Advanced Ultrasonic Techniques for Air Void Size Distributions in Early-Age Hardened Concrete*". The project was approved by the EC in the amount of **$10,000** with an equal match required from the PI for funding of the project. Deliverables for the two year project include two proposal submissions to NCHRP IDEA program and/or NSF plus two research papers to outside sources.

- Myounghoon (Philart) Jeon of the Cognitive and Learning Sciences Department (CLS) was awarded a three year project for efforts to establish a presence on Michigan Tech's campus in the Intelligent Transportation Systems (ITS) arena. Jeon developed a three year blueprint for development of a driving research consortium with multiple collaborators in his efforts to "Build the ENGIN (Exploring Next Generation IN-Vehicle INterfaces) Consortium at MTTI". Funding of **$20,000** was approved in year one with plans for two additional years funding totaling of $60,000. Jeon has pledged matching support to create a self-perpetuating center on campus.

- Guy Meadows (GLRC), Colin Brooks (MTRI) and Brian Barkdoll (CEE) collaborated on a major initiative proposal titled "*Positioning Michigan Tech to Become a Leader in Acoustic Sensing of Bridge Scour*". After review, the EC recommended funding in the amount of **$10,000** as the proposal did not fit the definition of a major initiative. Meadows responded with regrets in not accepting the partial funding offer.

- Melanie Kueber-Watkins (Facilities), Russ Alger (KRC) and Monica Alger (Thermoanalytics) collaborated on a proposal to develop a "*Snow and Ice Control Smartphone Application*". The EC offered the applicants **$5,000** for the project with a required $5,000 match to be supplied by the PIs. No response to the EC was ever received from the applicants and the proposal was shelved.

- Yue Li (CEE) has submitted a proposal in the amount of **$60,000** for "*Hazard Risk Assessment and Mitigation of Land Transportation Systems Considering a Changing Climate*". The EC required additional information in the form of sustainability, collaborators, deliverables and benefits to MTTI upon funding. The EC will further review the proposal when a response from Li is received.

MINOR INITIATIVES

As per a stated goal in the 2013 annual report, expansion into the Intelligent Transportation Systems (ITS) field was initiated. An ITS course was adopted into the CEE Department curriculum, a group of like-minded faculty/staff/students set up an ITS list serve for communication (ITS-I), Director Hodek represented MTTI at the ITS America World

Congress in Detroit and MTTI sponsored travel to ITS America for CEE student Lucey Kaare, third place winner of the ITS America student paper competition. MTTI is currently funding a major initiative in ITS with a planned workshop on campus in 2015.

MTTI continues to sponsor strategic/selected visitors on campus for outreach and educational opportunities plus provide cross campus faculty and researchers an opportunity to network with the visitors in a social setting. Two events were sponsored in 2014.

- Steve Bauer, Michigan Tech alumnus and current Engineer of Research at the Michigan Department of Transportation (MDOT) presented "Michigan DOT Research Program: Past Successes and Future Opportunities" to the CEE Graduate Seminar. A tour of Michigan Tech and MTTI facilities included demonstrations by MTTI members on the driving simulator, foundry, unmanned aerial vehicles, Benedict Lab and the Rail Transportation Program. A social networking reception was sponsored by MTTI and held in the Great Lakes Research Center.
- Matt Smith, ITS Program Manager at MDOT, presented a talk to the CEE Graduate Seminar "Intelligent Technology in Transportation". Smith also toured Michigan Tech and met with cross disciplinary researchers before greeting MTTI members at a social networking function in the GLRC.

A request in the amount of **$9,000** was made by CTT Director Tim Colling for assistance in the purchase of new office furniture for a necessary expansion of Dillman 317 to satisfy CTT's current work load. At the time of the request, CTT generated approximately 29.24% of IRAD returns to MTTI, more than satisfying the guidelines set by the EC committee for approval of the request. MTTI Director Hodek approved the expenditure for the CTT expenses.

A request for funding was received by Pasi Lautala, Director of the Rail Transportation Program, for staff support in the rebuilding of the program's website (to be finalized in 2015). The request was approved for **$4,000.**

MTTI collaborated with the Keweenaw Research Center in financial support of the annual Clean Snowmobile Challenge, hosted at Michigan Tech, in the amount of **$500**

Seven MTTI members applied for support in the form of travel to workshops or conferences for students or themselves based upon the guidelines set by the EC. Awards totaled **$500** each.

Approved cost share matching for a US DOT funded proposal by PI Thomas Oommen was realized in the amount **$18,700.**

Andrew Swartz requested **$3,000** from MTTI in cost share support for a USDOT RITA proposal titled "Autonomous Sensor Posts Concepts for Remote Sensing of Scour" in

collaboration with MTRI, as a subcontractor to the University of Maryland. The project was not funded by the USDOT.

MTTI collaborated with Joan Chadde (CSOE) to host a MDOT sponsored Transportation and Civil Engineering (TRAC) workshop for local educators providing teachers with hands-on tools for STEM (science, technology, engineering, and science) education and social studies. A luncheon was provided by MTTI for the daylong event.

Accomplishments

Research

MTTI members collaborated to submit proposals for funding from multiple agencies in the amount of **$15,293,370**. Of the **64** proposals submitted, **23** were successfully funded with an approval rate of **36%,** earning **$3,751,839** to the university in IRAD. Numerous proposals remain in 'pending' status and current on-going projects number **42**. Figure 4 presents a numerical review of proposals, awards and on-going projects over the past five fiscal years, with annual values of proposals submitted by MTTI membership shown in Figure 5. Research funding awarded to Michigan Tech from MTTI sponsored proposals for FY10 through FY14 is depicted in Figure 6.

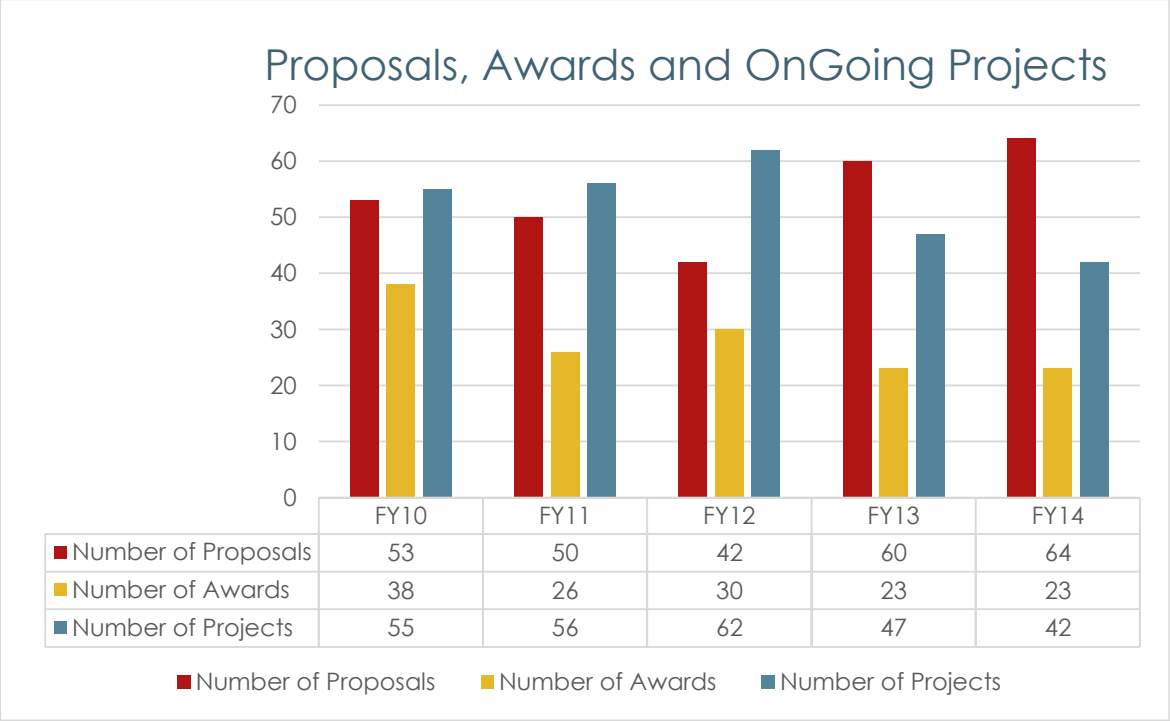


FIGURE 4: PROPOSALS, AWARDS AND ONGOING PROJECTS

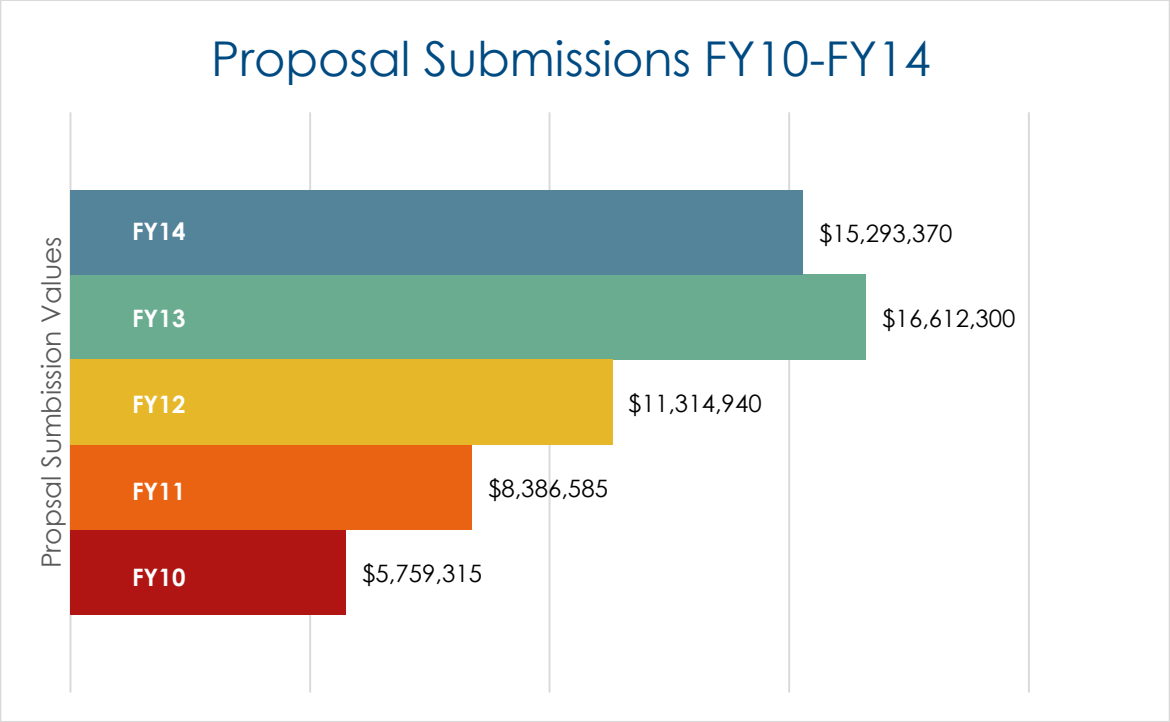


FIGURE 5: VALUE OF PROPOSAL SUBMISSIONS FY10-FY14

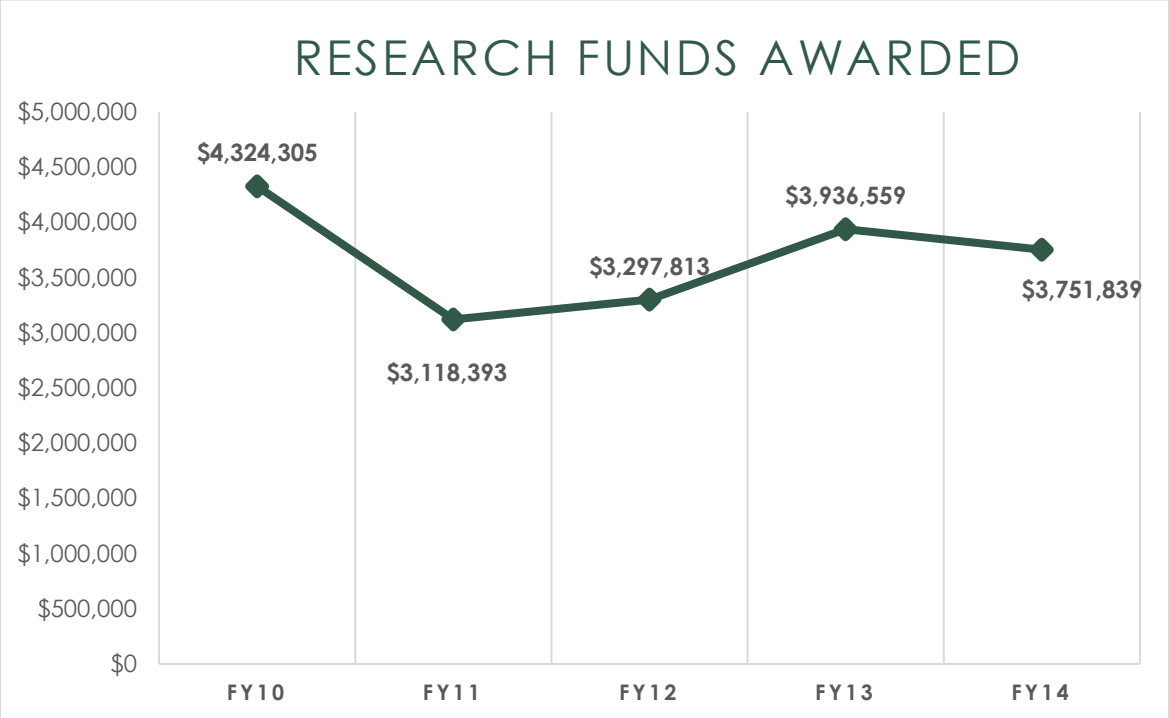


FIGURE 6: RESEARCH AWARDS

Institute

Stop gap funding was guaranteed to the Tribal Technical Assistance Program (TTAP) in an effort to prevent layoff of staff while awaiting verification of project renewal or extension of previous program by FHWA. Working with Human Resources, no layoff notices were issued to staff and work on deliverables continued as promised. A notice of renewal for TTAP was received by the Sponsored Programs Office before the stop gap funding was fully initiated.

MTTI continued to support growth and development of transportation on campus with the partial funding of an expansion by the Center for Technology and Training.

As a result of Director Hodek's presentation at the 2014 County Engineer's Workshop (CEW), a partnership for future transportation research has been formed with the Dickinson County Road Commission.

The County Road Association (CRAM) is considering funding a project to develop a method for seasonal weight restrictions based on Hodek's presentation at the CEW. Hodek was a featured presenter at the workshop and was sought by Upper Michigan's Source TV6 for his expertise in soil mechanics and foundational engineering.

MTTI provided networking opportunities to members with an invitation to multiple industry leaders for campus visits.

Two Summer Youth Programs in Transportation were again sponsored by MTTI in an effort to support workforce development for youth. The National Summer Transportation Institute (NSTI) and the Rail and Intermodal Transportation Program provide high school students with explorations in the transportation field via week long campus programs including field studies, classroom modules and industry speakers.

A letter in support of Kuilin Zhang's National Science Foundation proposal "Improving Spatial Observability and Controllability of Dynamic Traffic Systems through Ubiquitous Sensor Networks" offered MTTI's backing in "the evaluation of proposed models and algorithms for sensor networks, exploring the opportunities for technology transfer and helping to organize training workshops to disseminate the research outcomes to the State of Michigan". The proposal is pending.

MTTI Director Hodek also wrote a letter of support to the ENO consortium for Engineering Fundamentals Assistant Professor Jonathon Reihl. MTTI pledged a financial contribution towards expenses for Jonathon Riehl to the Eno Leadership Conference in Washington, DC, as well as submitted a letter of support backing Riehl for his leadership experience at Michigan Tech. Riehl was accepted to the conference for June 2015 with sponsorship funding of $1,000 provided by MTTI.

Outreach by MTTI continued with representation at both the Council for University Transportation Centers (CUTCU) and the Transportation Engineering and Road Research Alliance (TERRA) in which MTTI holds membership. Additionally, numerous members

attended the Transportation Research Board (TRB) annual meeting in addition to numerous transportation related workshops and conferences.

MTTI will continue to recognize and support MTTI members and to increase awareness of the Institute. Current MTTI membership is listed in Table 1.

TABLE 1: MTTI MEMBERSHIP

MTTI Membership FY 14

Principal Members	Department	Affiliate Members	Department
Ahlborn, Tess	Civil and Environmental Engineering	**Chadde, Joan**	Civil and Environmental Engineering
Anzalone, Jerry	Materials Science and Engineering	**Codere, Chris**	Center for Technology & Training
Barkdoll, Brian	Civil and Environmental Engineering	**Datta, Rupali**	Biological Sciences
Brooks, Colin	Michigan Tech Research Institute	**Dewey, George**	Civil and Environmental Engineering
Colling, Tim	Center for Technology & Training	**Dobson, Rick**	Michigan Tech Research Institute
Dai, Qingli	Civil and Environmental Engineering	**Dong, Jianping**	Mathematical Sciences
Hand, Dave	Civil and Environmental Engineering	**Gilbertson, Chris**	Center for Technology & Training
Havens, Tim	Electrical and Computer Engineering	**Graman, Greg**	School of Business and Economics
Heiden, Pat	Chemistry	**Griffis, Veronica**	Civil and Environmental Engineering
Jeon, Myounghoon	Cognitive and Learning Sciences	**Hiller, Jake**	Civil and Environmental Engineering
Lautala, Pasi	Civil and Environmental Engineering	**Kiefer, John**	Center for Technology & Training
Li, Yue	Civil and Environmental Engineering	**Koszykowski, Nick**	Center for Technology & Training
Liu, Zhen	Civil and Environmental Engineering	**Kueber, Melanie**	Facilities Management
Mukherjee, Amlan	Civil and Environmental Engineering	**Mahmoudian, Nina**	Mechanical Engineering-Engineering Mechanics
Oommen, Thomas	Geological and Mining Engineering and Sciences	**Nelson, Dave**	Rail Transportation Program
Sanders, Paul	Materials Science and Engineering	**Onder, Nilufer**	Computer Science
Schlaff, Gary	Center for Technology & Training	**Ong, Keat**	Biomedical Engineering
Sutter, Larry	Materials Science and Engineering	**Peterson, Luke**	Center for Technology & Training
Swartz, Andrew	Civil and Environmental Engineering	**Pouryousef, Hamed**	Rail Transportation Program
Velat, John	Tribal Technical Assistance Program	**Roussi, Chris**	Michigan Tech Research Institute
Vitton, Stan	Civil and Environmental Engineering	**Ten, Chee-Wooi**	Electrical and Computer Engineering
You, Zhanping	Civil and Environmental Engineering	**Watkins, Dave**	Civil and Environmental Engineering
Zhang, Kuilin	Civil and Environmental Engineering		

Space Facilities and Requirements

Current MTTI facilities include two offices for research development, a multi-media conference room equipped with updated technological communication equipment with capabilities for broadcast of webinars, and a computing laboratory/library for student activities. Currently, no additional space is required by MTTI. Future needs will be dictated by the growth of the Institute.

Facilities utilized by MTTI research members include:

The **Center for Structural Durability (CSD)**, sponsored by MDOT, utilizes Benedict Lab U112A in support of durable and sustainable solution improvements in infrastructure based upon MDOT needs.

An additional MDOT funded research center, the **Transportation Materials Research Center (TMRC)** maintains laboratories for hot mix asphalt, asphalt binder, aggregates and portland cement.

The **Intelligent Robotics Laboratory (IRL)**, directed by MTTI PI Tim Havens (ESE), is housed in the EERC and maintained through the Electrical Engineering Department. Havens is currently assisting the Michigan Department of Transportation (MDOT) to create a system of drones, or Unmanned Aerial Vehicles (UAVs), that will aid in transportation maintenance.

The **Materials Characterization Laboratory** specializes in characterization of construction materials (e.g. aggregate, cement, fly ash, concrete and asphalt) but also is equipped to characterize metals, polymers or virtually any other solid material.

The **Materials Processing and Fabrication Metal Casting Lab** (Foundry) is directed by Paul Sanders (MSE). The foundry facility supports metal-casting activities, primarily focusing on aluminum and iron and is available to all at Michigan Tech for educational and research purposes.

The primary research goal in **MindMusicMachine Laboratory (MMM)** of Philart Jeon (CLS) is directed toward understanding of the mechanisms of human mind and designing better interactions between people and technology, including those issues affecting transportation. Driving simulators with both traffic and rail software are utilized in recognizing the role of human factors in transportation for planning, design and accident mitigation.

Kuilin Zhang's (CEE) **High-Performance Computing Laboratory on Sustainable and Intelligent Transportation Systems (SITS-Lab)** is located in the Dow Building. The lab is equipped for transportation modeling software development and applications plus includes commercial transportation software for education.

Future Plans and Goals

Operational

With the advent of new regulations by the government regarding federal grant management (replacing OMB A-21, A-110 and A-133 and allowing new charges to be levied against federal funds), an additional source of MTTI IRAD revenue is to be discontinued at the close of FY15. The previously earned supplemental IRAD returns to the CTT TDG group have been eliminated and as such, the Institute's 14.44% IRAD as well. For FY14, MTTI's total IRAD from this source amounted to $45,543.07. New budgets and strategic plans for the Institute are being developed to allow for this substantial loss of revenue.

Continuing Education

As stated, the Director and Executive Committee will continue to research the idea of providing continuing education to Professional Engineers as the guidelines are better defined by the State of Michigan.

Expansion of Transportation Research Avenues

Opening new research venues beyond the traditional scope of transportation at Michigan Tech is a goal of both the Director and the EC. MTTI is increasing travel funding available to members with the expectation that potential PI's travel to conferences and workshops where new and novel research ideas can be explored and relevant point of contacts made.

Continued Initiative Funding

A concentrated effort to provide resources for growth in existing programs or development of new major initiatives on campus was executed in 2014 and will continue in 2015. Members will continue to be made aware of funding availability for research initiatives on a regular basis.

Outreach

MTTI will continue to sponsor visitors to campus for outreach and education opportunities in an effort to expand cross disciplinary membership and provide networking venues to expand and increase MTTI research options.

Summary

Operationally MTTI continues to provide backing to members under the leadership of Director Hodek and in collaboration with the elected Executive Committee. In review of 2014, MTTI continued:

- Support of members financially through major and minor initiative funding,
- Administrative support on all transportation related research proposals,
- Efforts to provide outreach opportunities with financial funding of visitors to campus,
- Support of student educational activities with the goal of producing superior candidates for the professional workforce.
- Encouragement of cross disciplinary activities,
- Establishing future goals for continued growth of the Institute.

MTTI continues to strengthen the Institute through support of the established mission as demonstrated by the previous year's activities and accomplishments.

Appendices

- List of MTTI proposals submitted for 2014
- MTTI definition of proposal vs. initiative
- EC example of major initiative

Appendix A: MTTI Proposals Submitted 2014

1401069	1/24/2014	Q. Dai		WISDOT	Self-Consolidating Concrete for Prestressed Bridge Girders	$69,999	Declined
1310056	1/30/2014	C. Hu	Z. You, Q. Dai, X. Yang	MDEQ	Crumb Rubber Modified Asphalt as a Crack/Joint Sealant and Pothole Repair Material	$422,530	Declined
1310051	1/30/2014	Q. Dai	Z. You	MDEQ	Reusing Steel/Plastic Fibers in Reinforced Concrete and Structural Material	$498,660	Declined
1310052	1/30/2014	Q. Dai	S. Fang	MDEQ	Incorporating Surface Treated Rubber Particles into Portland Cement and Concrete for Reduced Brittleness	$499,622	Declined
1310050	1/30/2014	Z. You	Q. Dai, X. Yang	MDEQ	Low Emission Asphalt Pavements with Crumb Rubber	$1,711,720	Awarded
1310054	1/30/2014	D. Hand	Z. You, Z. Ahmed	MDEQ	Assessment of Emissions of Crumb Rubber Modified Asphalt	$672,585	Awarded
1402042	2/10/2014	K. Zhang		NSF	Improving Spatial Observability and Controllability of Dynamic Traffic Systems through Ubiquitous Sensor Networks	$200,000	Declined
1402041	2/10/2014	Z. Liu		NSF	Characterization of Frozen Soils Using the Phase Composition Curve	$202,239	Declined
1300296	2/10/2014	Z. You		NSF	Amendement: proposal #1300296	$12,000	Awarded
1403003	3/6/2014	T. Oommen		University of Arkansas	Remote Sensing Based Assessment System for Evaluating Risk to Transportation Infrastructure Following Wildfires	$233,728	Awarded
1403008	3/6/2014	A. Swartz	C. Brooks	University of Maryland	Autonoumous Sensor Posts Concepts for Remote Sensing of Scour	$416,194	Pending
1403005	3/7/2014	K. Zhang		University of MI Dearborn	RIPS Type I: A Resilient Framework for Electrification of Transportation	$64,202	Declined
1403010	3/6/2014	C. Brooks	C. Roussi, T. Colling, M. Watkins, R. Dobson	USDOT RITA	From Research to Implementation for Unpaved Road Assessment with Remote Sensing	$1,376,816	Pending
1403011	3/7/2014	Q. Dai		Case Western Reserve	Extended Life Concrete Bridge Decks Utilizing Improved Internal Curing to Reduce Cracking	$138,898	Pending
1404011	4/9/2014	D. Watkins	Y. Li, B. Barkdoll, V. Griffis, K. Zhang	NCHRP	FloodCast: A Framework for Enhanced Flood Event Decision Making for Transportation Resilience	$249,995	Pending
1404018	4/14/2014	J. Hiller	Z. Liu	NCHRP	Proposed Enchancements to Pavement ME Design: Improved Consideration of the Influence of Subgrade and Unbound Layers on Pavement Performance	$400,000	Pending
1404020	4/14/2014	J. Velat	J. Lidicker	University of MN	Safety Center for Excellence: Rural and Surface Transportation	$125,000	Pending
1404036	4/28/2014	Z. You	P. Heiden	Columbia University	Modern Infrastructural Materials and Design (MIMD) Network on Sustainable Building Envelopes and Infrastructure Structures	$150,000	Pending
1210003P1	4/25/2014	Z. You	P. Heiden	NSF	SusChEM/Collaborative Research: Fundamental Understanding of Foaming Process towards a New Warm Mix Asphalt	$5,000	Addl Funding
1405005	5/5/2014	C. Brooks		Limnotech	Limnotech 2014 UGLOS Bouy Support	$4,500	Pending
1405074	6/3/2014	J. Lidicker		Illinois Center for Transportation	Validation and Revision of Fees Charged for Oversize/Overweight Vehicle Permits	$294,000	Pending
1406006	6/3/2014	K. Zhang	C. Wooi Ten	NSF	Collaborative Research: Improving spatial observability and controllability of dynamic traffic systems through ubiquitous sensor networks	$1,070,997	Pending
1406005	6/3/2014	Z. Liu		NSF	Trans-scale Understanding of Water Movement in Non-Isothermal Vadose Zone	$253,309	Declined
1406018	6/9/2014	M. Jeon	P. Lautala, D. Nelson, T. Havens	Ohio DOT	Development and Evaluation of Railroad-Highway Grade Crossing Traffic Control Devices	$100,000	Declined
1406041	6/24/2014	Z. You		Columbia University	Ethanol Based Foaming Technology for Warm Mix Asphalt Pavement	$454,652	Pending

1309032	7/1/2014	P. Lautala	H. Pouryousef	University of Wisconsin Madison	Evaluating the Use of Operational Management Techniques for Capacity Improvements on Shared-Use Rail Corridors	$147,765	Awarded
1212016P1	7/2/2014	C. Brooks	T. Ahlborn, T. Havens, T. Oommen	MDOT	Evaluating the Use of Unmanned Aerial Vehicles for Transportation Purposes	$28,225	Addl Funding
1407006	7/2/2014	T. Colling	J. Kiefer, C. Codere	MDOT	2015 Michigan Local Technical Assistance Program	$513,075	Awarded
1406037	7/8/2014	G. Schlaff	C. Pinnow	Hawaii County Dept of Works	Hawaii County 2014 RoadSoft Data Integration Services	$13,629	Awarded
1407043	7/23/2014	Q. Dai		NSF	CAREER: Fusion of Physico-chemical Characterization and Multiscale Investigation for Durable Multifunctional Asphalt Materials - Integrated Research and Education Plan	$677,897	Declined
1407046	7/23/2014	Y. Li	T. Oommen, P. Xue	NSF	Collaborative Research RSB: A Resilient and Sustainable Building Design Framework from a Multi-hazard Interdisciplinary Perspective	$480,000	Declined
1301033P3	7/28/2014	T. Oommen		USDOT RITA	Sustainable Geotechnical Asset Management Along The Transportation Infrastructure Environment Using Remote Sensing	$100,003	Declined
1408018	8/19/2014	Z. You		NSF	IRES: US/Malaysia Research Experience for Students in Porous Asphalt Materials	$286,386	Declined
1207010P3	8/19/2024	T. Colling		Cambridge Systematics	Tools, Training & Technical Assistance for Local Rural and Tribal Roads Practioners - Finishing Scope for Cambridge Systematics in support of FHWA	$20,000	Addl Funding
1408036	8/26/2014	T. Colling	G. Schlaff, N. Koszykowski	MDOT	Implementation of RoadSoft for MDOT Safety Services	$264,351	Awarded
1409035	8/26/2014	T. Colling	J. Kiefer	MDOT	TAMC 2015	$99,345	Awarded
1408035	8/28/2014	J. Chadde		University of Memphis	Nationwide Best Practices to Implement Freight Transportation Careers	$45,288	Pending
1408039	8/28/2014	T. Colling	C. Gilbertson	MDOT	MI Bridge Load Rating Support & Tech Transfer FY2015-2016	$36,180	Awarded
1409032	9/11/2014	K. Zhang		UM Dearborn	DHS S&T Critical Infrastructure Resilience Center of Excellence (CIRC) - Center Partner: A Resilient Framework for the Electrified Transportation Systems	$95,000	Pending
1409049	9/12/2014	K. Zhang	Zhuo Feng	NSF	EAGER-Dynamic Data: Towards Dynamic Big Data Driven Intelligent Transportation Systems (DBDITS) Leveraging Heterogenus Big Computing Systems in the Cloud	$300,000	Pending
1409054	9/15/2014	Z. Liu		NSF	Collaborative Research: Unified Theory for Poromechanics	$141,655	Declined
1409057	9/15/2014	Z. Liu	A. Swartz, Y. Sun	NSF	Cardiography of Bridges for Scour Monitoring with Self-Powered System-on-a-Chip	$348,647	Pending
1409055	9/15/2014	Q. Dai		NSF	Physico-chemical Investigation of Water/Moisture Damage Mechanism of Asphalt Mixtures	$299,745	Pending
1409058	9/15/2014	Z. Liu	P. Xue, J. Meldrum	NSF	Scientific Understanding of Mine Water as a Geotherma Resource	$454,891	Declined
1409056	9/15/2014	Z. Liu	Y. Yang	NSF	Development of Framework for Multiphysics in Porous Materials	$313,007	Pending
1409063	9/18/2014	Z. You		NSF	Collaborative Research: Sustainable Civil Infrastructure and Systems with Energy Harvesting	$45,000	Pending
1409001	9/20/2014	S. Vitton		National Academies	Using High Strain Rate Dynamics for the Assessment of Aggregates and PCC Used in Highway Construction Materials	$136,468	Pending
1410004	10/2/2014	T. Colling	J. Kiefer	MDOT	2015 TAMC Education Program	$177,909	Awarded

1306033	10/15/2014	J. Velat		FHWA	TTAP	$10,000	Addl Funding
1410035	10/17/2014	G. Schlaff	N. Koszykowski	Elkart County Hwy Dept	Elkart County Hwy Dept	$1,984	Awarded
1410034	10/17/2014	T. Colling	G. Schlaff, L. Peterson, N. Koszykowski	MDOT	RoadSoft Asset Management System Development & Support	$723,778	Awarded
1410049	10/24/2014	Z. You	X. Yang	MIDEQ	Effective Pavement Construction, Maintenance, and Repair Materials Using Scrap Tire Rubbert Modified Asphalt	$1,000,000	Pending
1410055	10/24/2014	Q. Dai	Z. You	MIDEQ	Foaming Technologies for Crumb Rubber Modified Asphalt with Recycled Materials	$1,000,000	Pending
1410053	10/24/2014	Q. Dai	S. Fang	MIDEQ	Incorporating Surface Treated Rubber Particles into Portland Cement and Geopolymer Concrete to Improve Field Performance	$666,926	Pending
1410047	10/24/2014	K. Zhang		UW Milwaukee	Integrating Big Data-driven Approach into a Simulation-based Dynamic Traffic Assignment Model for Work Zone Impacts Assessment	$34,200	Pending
1410051	10/28/2014	T. Colling		MDOT	2015 MERL	$110,545	Awarded
1411095	11/24/2014	T. Oommen		Univ of Texas Arlington	Hazard SEES: Evaluating, Monitoring & Mitigating Hazard to Critical Infrastructure from Increased Seismic Activity in or near Injection Wells	$1,214,204	Pending
1411094	11/24/2014	K. Zhang		George Washington University	Hazard SEES: Leveraging Social Media, Cyber Infrastructure Connectivity and Information Dissemination for Improved Evacuation Modeling and Design	$630,000	Pending
1411099	11/24/2014	P. Lautala		MDOT	NURail Tier I	$124,997	Awarded
1411103	11/26/2014	Y. Li		Florida International Univ	Integrated Modeling of Coastal Vulnerability and Social Complexity for Promoting Community Resilience	$300,000	Pending
1412054	12/18/2014	Q. Dai		Case Western Reserve	Extended Life Concrete Bridge Decks Utilizing Improved Internal Curing to Reduce Cracking	$92,695	Pending

(BLUE SHADED FY14, PINK SHADED FY15)

Proposal submissions may have a lag time of nearly one year before status of a project is updated.

Appendix B: MTTI definition of proposal vs. initiative

MTTI Initiative vs. Project

Objective

MTTI is interested in funding the development of exploratory projects and larger initiatives that increase the overall research funding coming to MTTI members. It is not the place of MTTI to fund projects or initiatives simply for the intellectual output that they produce, but rather to provide seed money to move forward key activities that unlock a larger pool of resources.

Seed Funding Project (up to $10,000)

Exploratory projects can be partially supported several ways through MTTI. In all cases these projects result in a deliverable that produces a chance at a return on the investment that MTTI made. For example, a MTTI member may request funds to match funds that they have to perform exploratory research that will provide a better chance at creating a successful research proposal. In this example, MTTI is not interested in funding the exploratory research for its intellectual value, but rather for the potential research areas that a proposal based on this exploration will bring. Projects are expected to have a defined set of deliverables and outcomes that will be provided when the activity is complete. Those deliverables should relate to future proposal activity enabled by MTTI seed funding. Projects are of a defined term and the payback for MTTI to be involved in them is primarily through enhanced probability of successfully funded research projects and their associated overhead return.

Major Initiatives (up to $60,000)

Initiatives are larger, often highly-collaborative activities that generate self-perpetuating resources in the form of long-term external project funding or other resources, and that may lead to stable programs or centers that provide for the common good of many MTTI members. MTTI's investment in initiatives should be used as a means to capture outside resources. MTTI members who apply for initiatives should be able to demonstrate external commitment outside of MTTI and should be able to show how the activity proposed will be supported after MTTI's investment is expended. They should also include a budget that outlines the cost of the proposed activities and their expected progress toward self-perpetuation of the initiative. An initiative is not a group of projects, but rather a self-perpetuating resource in support of MTTI's vision and mission statement.

As an example, a MTTI member may propose to secure a post-doctorate fellow or other professional staff member to help create a Center for Intelligent Transportation Research. In this example, the post doc and the MTTI member would be responsible for accomplishing activities with the initiative funding that lead to long-term support, such

as creating a portfolio and presentations, workshops to build new collaborations, as well as travel to sponsor locations to garner support in the form of industry donations or projects for the center. The MTTI member proposing an initiative needs to show how the MTTI investment will be successful in perpetuating long-term funding and intellectual activities as well as show that there exist sources or funds available to complement this activity.

Appendix C: EC example of major initiative

Major Initiative Examples

Rail Transportation Program

Background

After three successful, six week summer courses in rail transportation (Summer in Finland 2004-2006) and early initiatives related to rail research, a Rail Transportation Initiative (RTI) was proposed with the future goal of taking the Michigan Tech railroad engineering program to a higher level. The initiative was defined as:

- Three years in duration
- Initiative would involve railroad engineering and urban rail transit
- Initiative would be available to students in several disciplines (eventually develop a Minor in Rail Transportation, a Certificate in Rail Transportation)
- Priority in undergraduate level (due to rail industry interest in educated workforce) but rail transportation could expand to graduate student program
- Could involve distance learning/on-line course originating at Tech or transmitted to Tech
- Would include rail related research, scholarships, internships
- Would work with others to obtain funding and support – foundations, alumni, government organizations (FRA, NSF) and others

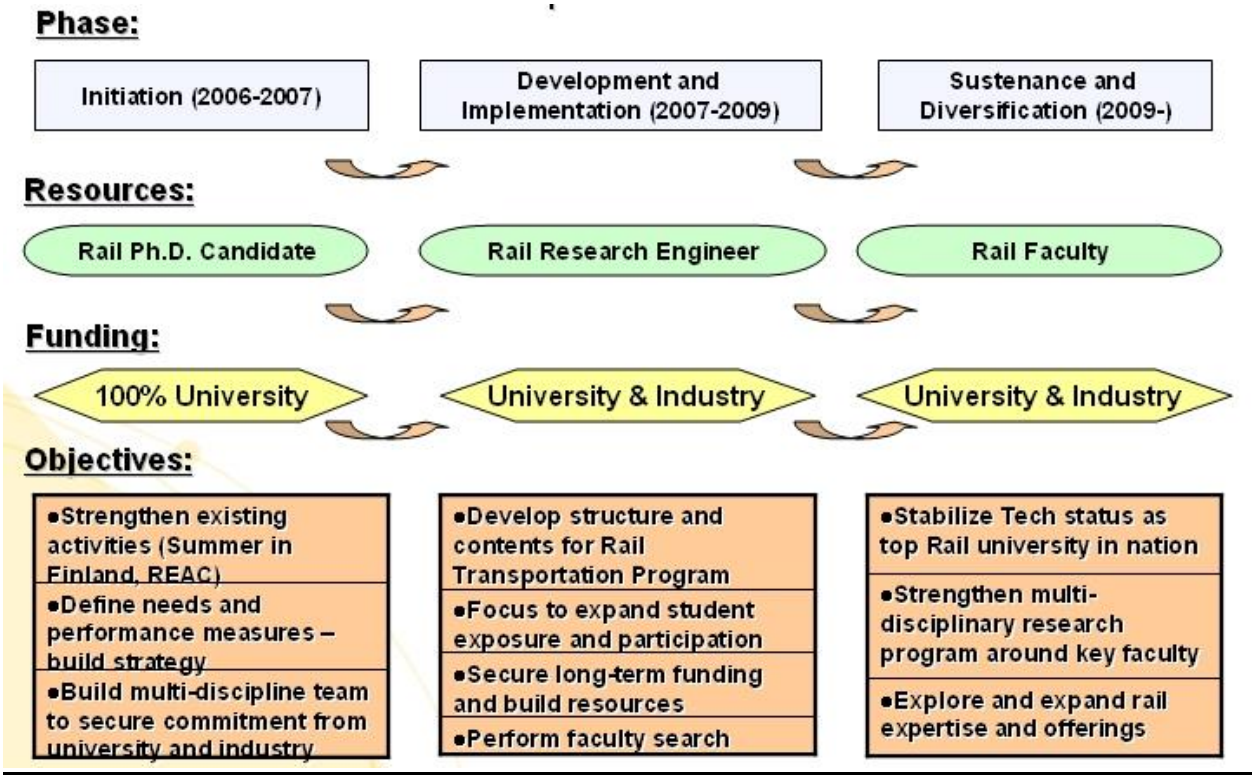
Strategy

1. **Establish Rail Transportation Program - Rail** Transportation Program (RTP) would be established to host all rail related activities at Michigan Tech and to provide structure to the field for development. Main action would be to create a Director position to build leadership for first two years. Position would be liaison between industry, university and rail board. Position would explore campus wide curriculum development, conduct minimal teaching and perform extensive industry relations and external funding solicitations.
2. **Focus to expand student exposure and participation** – Due to rail industry interest in undergraduates, emphasis was on providing good service to "clients" and increase the visibility of the industry in various ways, such as new coursework, support of Railroad Engineering and Activities Club (REAC) and related activities, development of marketing materials, etc.
3. **Secure long term funding and build resources –** The initiative included development of a long term plan early to set in motion industry and institutional support mechanisms and to investigate potential long term funding opportunities in research, education and outreach.

4. **Perform faculty search –** If successful, the ultimate goal was to perform a faculty search that would solidify the Program and rail related activities on campus.

Program Timeline

Figure below presents the plan and timeline for the initiative. The MTTI funding was requested for Development and Implementation phase in 2007-2009.



Funding

Initial funding was budgeted/requested at $45,000 per year for a three year period, totaling $135,000. Commitments at Michigan Tech were received from MTTI for $20,000 per year ($60,000), from the VPR for $15,000 per year ($45,000) and from CEE for $10,000 per year ($30,000). Industry was simultaneously approached for similar funding commitment and two annual partnerships ($33,000 each) with the industry were targeted. While there was expectation that some research funding would also materialize, specific amounts were not included in the initial plan.

External funding far exceeded the expectations. Table below presents the planned and actual funding during the initiative.

Table: Planned vs. Actual Funding

Source	FY08	FY09	FY10
PLAN			

Michigan Tech	$45,000	$45,000	$45,000
Industry	$66,000	$66,000	$66,000
Total	**$111,000**	**$111,000**	**$111,000**
ACTUAL			
Michigan Tech	$45,000	$45,000	$45,000
Private	$45,000		
Industry	$66,000	$128,500	$131,400
Research	$291,405	$155,140	$212,682
Total	**$447,405**	**$328,640**	**$344,127**
% Above Plan	**75%**	**66%**	**68%**

Budget and Expenses

The main budget item was to cover 50% of the RTP Director salary from the Michigan Tech funding sources, while the other half was going to be covered from the industry. The main target for additional funding was to utilize it toward development of additional educational and research resources and promotional items. As the income above Director's salary hadn't been solidified, no specific dollar amounts were identified for these categories.

Performance Metrics

While no specific metrics beyond the capability to secure the external funding were established in the beginning of the initiative, several metrics were quickly developed to track the progress on the program and demonstrate its performance to clients. Some of the key metrics included:

- Number of students participating in rail related curriculum activities (courses, senior design and research projects)
- Number of student members in REAC
- Number of scholarships won in nationwide AREMA competition
- Annual level of external research funding secured

Progress beyond initiative

The Rail Transportation Program (RTP) has continued its growth since the expiration of MTTI Initiative that got it started. From human resources perspective, the Program Director obtained a tenure-track faculty position in 2012 and a full time senior research engineer (and lecturer) was hired in 2013. The program offers annually three rail specific courses and has typically several externally funded student design projects. Since 2009, there has been xx externally funded research projects that the program has been either leading (or participating in) with total worth of over $x,xxx,xxx (these are funds directly controlled by the RTP faculty). Since 2012, RTP has also been a member of a federally funded University Transportation Center. To date, faculty and students from seven different departments are (or have been) working on these projects.

Key "ingredients" for success

Looking back, there were several key reasons, why the initiative turned out successfully (if it's considered a success):

- **Building on existing capabilities** – the program had already a good start at the time when funding was requested and it had presented its capabilities for the university and rail industry, making it easier to sell the product.
- **Developing strong and versatile support base** – the program did not rely on a single source for funding, but commitment was inquired and obtained from several entities within the Michigan Tech and the rail industry. MTTI was only portion of the total funding, making it easier to make investment decision.
- **Program, not a project** – the initiative attempted to make progress in multiple fronts. Therefore, a failure in one of the activities would not necessarily bring down the whole program, but rather force it concentrate on another direction.
- **Long term vision and understanding the needs of client** – while the long-term funding and program direction were not fixed, there was an overall vision of the key objectives for the program that matched the highest priority for the client (rail industry) in their need for new talent.