



MTTI ANNUAL REPORT FY15

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To: Dave Reed, Vice President of Research

May 26, 2016

Michigan Tech
Transportation Institute

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THE YEAR IN REVIEW

The Michigan Tech Transportation Institute (MTTI) continues to support the institute's mission established in the Charter and Bylaws of 2010. The Director, in collaboration with the Executive Committee, has led MTTI to a successful completion of all goals set for the institute in 2014.

These goals, as stated in the annual report to the Vice President of Research in 2014, included:

- ◆ New budget and strategic plan to compensate for the loss of Center for Technology & Training (CTT) Technology Development Group (TDG) revenue returns to MTTI
- ◆ Continued initiative funding
- ◆ Increase outreach opportunities to members
- ◆ Expansion of transportation research avenues beyond the traditional scope of transportation
- ◆ Continuing education resources for the State of Michigan licensing of Professional Engineers

Though MTTI realized a loss of income due to the new federal grant regulations and the CTT TDG agreement with the Vice President of Research Office, support of MTTI members continued with funding of initiatives, proposal support, educational programs and outreach through workshops, travel to conferences and campus speakers.

An initiative proposal by **Dave Nelson** of the Rail Transportation Program was approved and funded in the amount of \$10,000 with a 1:1 match requirement. MTTI supported the renovation and expansion of the CTT workspace in Dillman Hall (\$60,000). Proposal preparation support was provided for labor charges in the submission of a \$4.8 million, six year proposal to the Environmental Protection Agency. The project was awarded to Michigan Tech as the EPA Environmental Finance Center for the Great Lakes Region (Region 5). 14 MTTI members were awarded travel stipend funding for their participation in leading transportation organizations.

As a result of a funded MTTI initiative project, **Philart Jeon** (CLS) hosted visitors on campus from the EQUOS Research Company of Tokyo, Japan, interested in his research in Intelligent Transportation Systems (ITS). The visit resulted in funding by the EQUOS Company of two ITS projects on campus, led by Dr. Jeon.

MTTI continued affiliation with the Council for University Transportation Centers (CUTC). CUTC provides a forum for universities with transportation centers to interact collectively with government and industry. Five proposals for University Transportation Centers (UTC) were submitted by MTTI in response to the current request for proposal by the US DOT

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."

(2016). Support was also provided for members through the newly re-organized National Road Research Alliance (NRRRA), previously known as TERRA. The NRRRA is a pooled fund organization that plans to provide projects to members which focus on solving problems impacting roads. Five state DOT's have provided funding to the pool including the Michigan Department of Transportation (MDOT). MTI expansion of outreach opportunities available to members included involvement in the American Public Transit Association (APTA). APTA is involved in advocacy, education, and research to strengthen and improve public transportation. Membership in CUTC, NRRRA and APTA provide MTI members with a venue to showcase expertise and to increase networking opportunities. MTI funds membership fees to each organization on behalf of MTI researchers.

Researchers participating in projects housed in MTI are from nearly every department, center or institute on campus. An effort to include and involve new members was a result of a previous year's goal to expand transportation research avenues beyond the traditional scope of transportation. Newest researchers come from the Social Sciences and Humanities Departments. Partnering programs and centers continue to be: Center for Science and Environmental Outreach, Center for Technology & Training, Keweenaw Research Center, Michigan Tech Research Institute, Rail Transportation Program and the Tribal Technical Assistance Program.

Continuing education hours for the licensing of professional engineers are slated to begin in 2016, as set by the State of Michigan. MTI continues to investigate the opportunities available in 2016 and will decide on a future direction after discussions between the Director and Executive Committee.

The MTI Executive Committee continues to work with Director Hodek on successful implementation of the MTI mission. In FY15, the committee was composed of three principal members and two affiliate members. Current committee members include:

Principal Members– Chair Andrew Swartz (CEE), Amlan Mukherjee (CEE) and Colin Brooks (MTRI)

Affiliate Members – Pasi Lautala (CEE) and Chris Gilbertson (CTT)

Further development of the institute continues in 2016. MTI organized researchers across campus in the submission of a five year master contract as a pre-approved vendor with the Minnesota Department of Transportation (MnDOT) for their "Research Services Academic Research Program". Fifty multi-disciplinary PIs provided an overview of their expertise and facilities available to MnDOT. Collaborations included non-traditional transportation departments such as the Van Pelt and Opie Library and the departments of Forestry and Physics. The Great Lakes Research Center (GLRC) and the Sustainable Futures Institute (SFI) also partnered on the proposal. The application for this contract was approved by MnDOT with **Ralph Hodek** serving as Principal Investigator.

The USDOT recently released a request for proposal for their University Transportation Centers (UTC). The centers are scheduled for six years with funding amounts up to \$1.5 million annually. MTI supported five UTC proposals both administratively and financially by providing cost share funding as a required match by the USDOT.

Invited as a guest speaker with financial support from MTI was Terry Stepanski, Senior Project Manager at MDOT and a 1985 graduate of MTU in Civil Engineering. He presented an overview of the I-94 corridor reconstruction and expansion at an estimated cost of \$5 billion. Stepanski presented to the CEE graduate seminar, two senior professional practice classes, and was guest of honor at a social hosted by MTI for students, faculty and staff.

A letter of support was written for [Pasi Lautala's](#) Research Excellence Fund (REF) Research Seed Grant proposal entitled "Driver Behavior at Highway/Rail Grade Crossings".

The Director and Executive Committee continue to develop a future path for MTI in 2016.

USE OF IRAD FUNDS

Institutional Research and Development Funds (IRAD) earned by MTI are used for MTI operating expenses and for strategic investment. MTI IRAD returns (Figure 1), expenditures (Figure 2) and balances (Figure 3) are depicted for a five year period from FY11 through FY15.

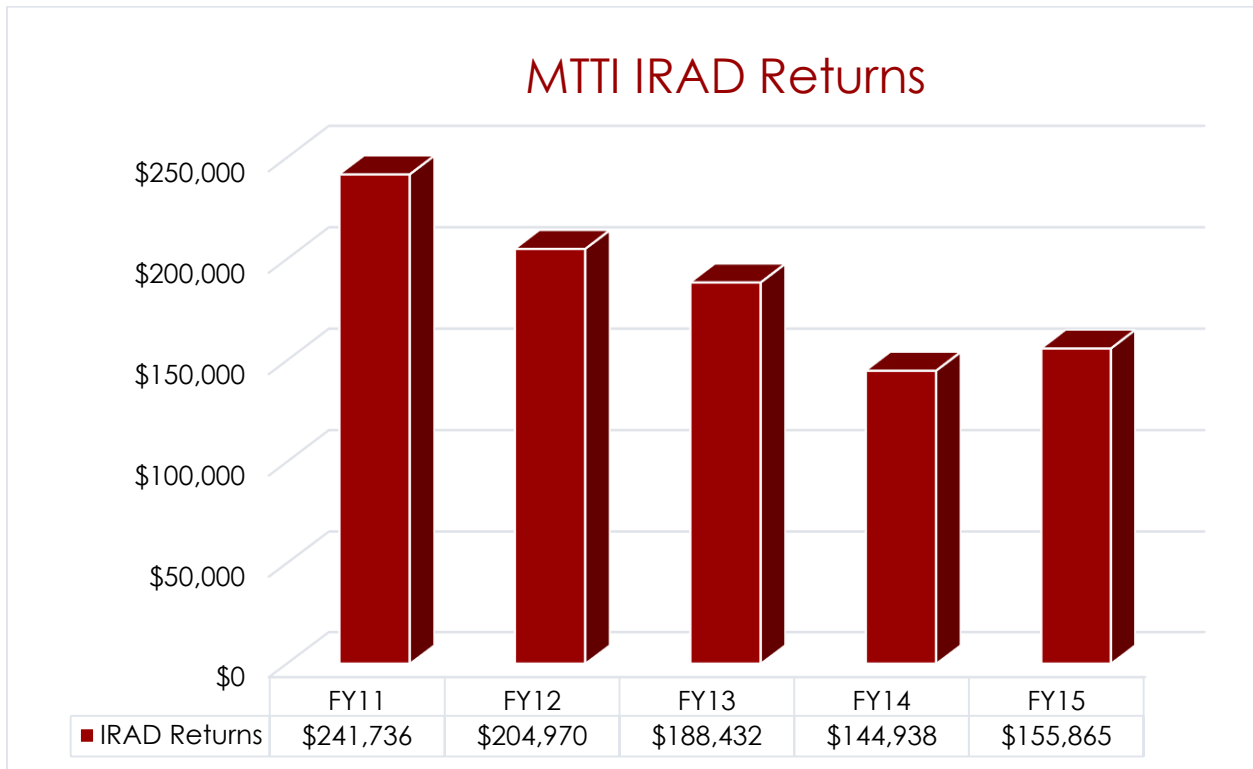


FIGURE 1: MTI IRAD RETURNS

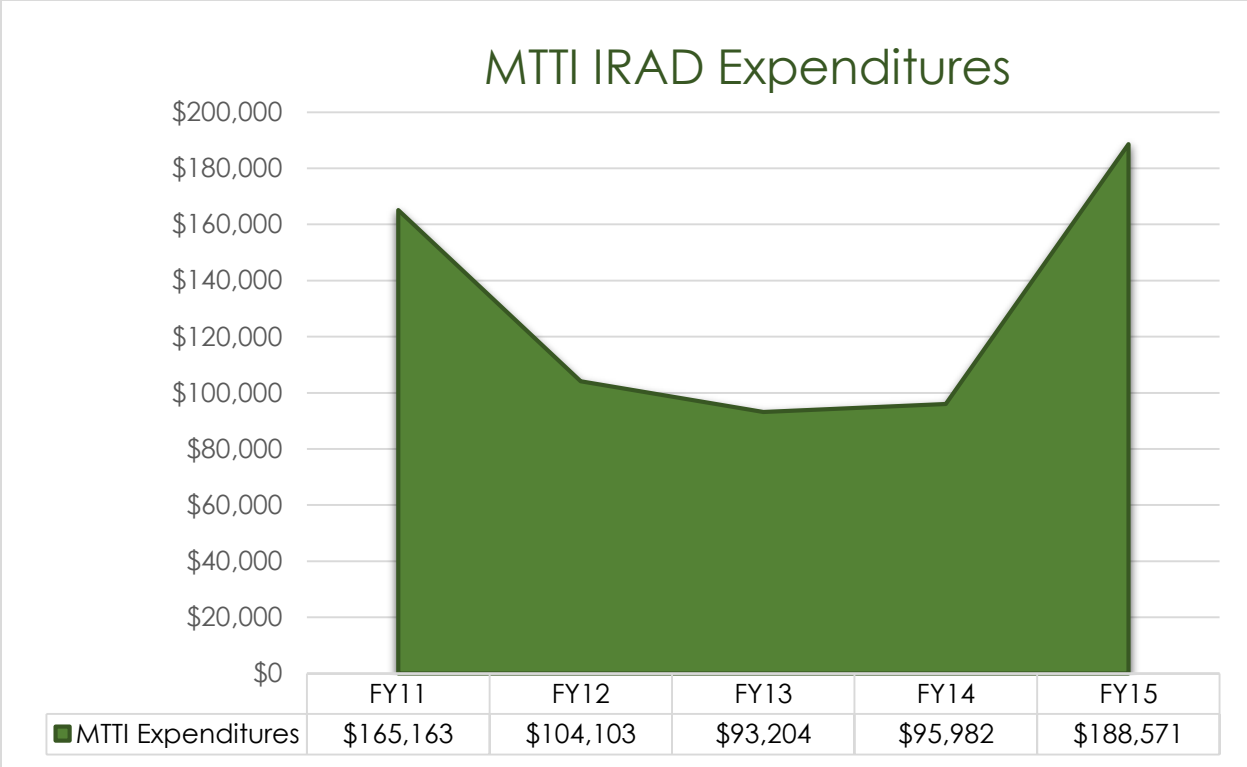


FIGURE 2: MTTI IRAD EXPENDITURES

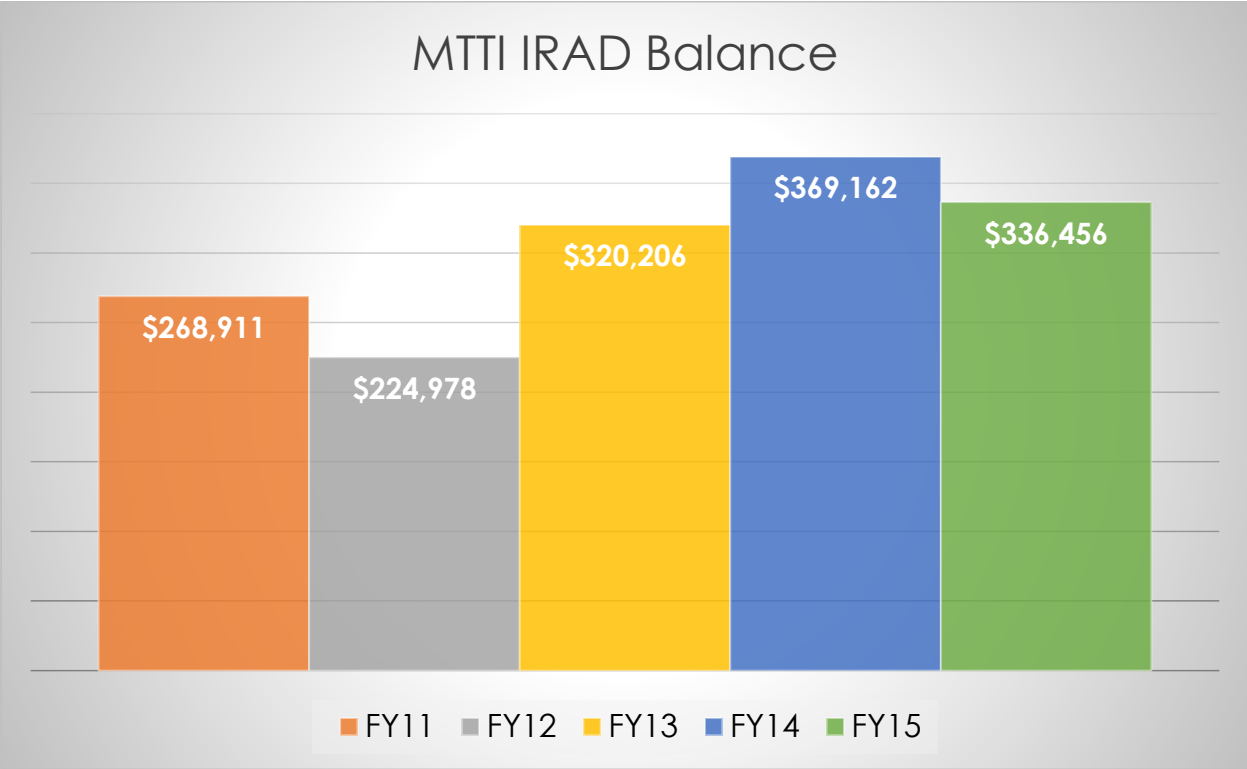


FIGURE 3: MTTI IRAD BALANCE

GROWTH THROUGH INVESTMENT

Michigan Tech IRAD funds are general funds allocated to Centers and Institutes for use in enhancing research and increasing graduate support. MTI allocates a portion of the Institute earned IRAD to support internal research by member Principal Investigators, sponsor speaker visits, provide workshops, support student education, and assist with member travel.

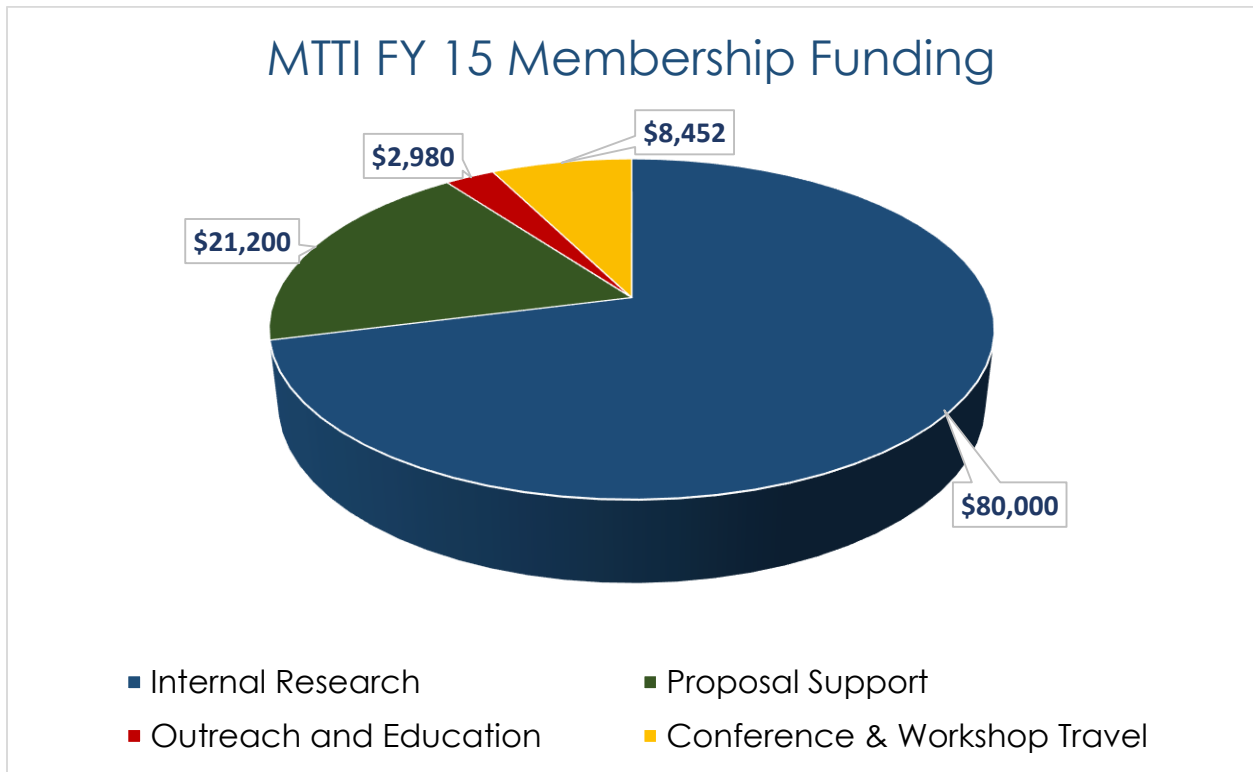


FIGURE 4: MTTI FY15 MEMBERSHIP FUNDING

INITIATIVE FUNDING

Two major initiatives with potential funding of \$60,000 each, in phased increments over a three year period, were supported with MTTI IRAD funds during the previous year. Successful completion of project deliverables is required before additional second year funding is approved by the Director and Executive Committee.

MTTI providing first year funding in the amount of \$20,000 for Phase I of **Myounghoon (Philart) Jeon's Building the ENGIN (Exploring Next Generation IN-Vehicle INterfaces) Consortium at Michigan Tech.**

The initiative proposed a phased path for an innovative research and educational program at Michigan Tech focused on the driving domain with the expectation that the effort will:

- 1) Lead to a sustainable, officially recognized Driving Research Center under MTI
- 2) Expand the scope across campus to build an ENGIN consortium to identify and develop additional driving-related collaborative research projects
- 3) Make continuous efforts to secure external funding for driving-related projects
- 4) Develop a more systematic driving education program for undergraduates, graduates, and K-12 students

A workshop "Developing Partnership and Advancing Driving Research" was hosted by Dr. Jeon on Michigan Tech's campus for 25 participants in May 2015. Goals of the workshop were to identify plausible research projects and internal/external collaborators in the field of intelligent transportation and featured expert speakers on autonomous vehicle research from the University of New Hampshire, Georgia Tech, Michigan Department of Transportation and the Johannes Kepler University in Linz, Austria.

Following this workshop, Dr. Jeon was invited to host a workshop on "in-vehicle auditory interactions" in Graz, Austria for the ICAD (International Conference on Auditory Display), a recognized conference on auditory display and sonification. In addition, Dr. Jeon and colleagues presented four research projects at the ICAD Conference; "Regulating Drivers' Aggressiveness by Sonifying Emotional Data", "Subjective Assessment of In-vehicle Auditory Warnings for Rail Grade Crossings", "Exploration of Semiotics of New Auditory Displays: A Comparative Analysis with Visual Displays" and "Cultural Differences in Preference of Auditory Emoticons: USA and South Korea".

Additionally, Dr. Jeon has instituted a Driving Seminar Speaker Series in order to build a driving research consortium at Michigan Tech. In the future, the series will be broadened to include worldwide webcasts. Topics such as human factors, issues-distracted, stress and fatigue, emotions, electric vehicles and autonomous vehicles, sensors, grade crossing, and naturalistic driving research are scheduled for spring 2016.

As a deliverable of Phase I, Dr. Jeon also submitted three proposals:

- "Auditory Interactions as a Countermeasure against Aggressive Driving: Applications for Emotional Driving and Eco-Driving" was submitted to the National Science Foundation. Status: Pending
- "Sonic Information Design for Intuitive In-vehicle Interactions (Phases I and II) to the EQUOS Research Company. Status: Both projects were funded

The EQUOS Research Company from Tokyo, Japan partnered with Dr. Jeon on the two research projects directly related to this MTI funded project after visiting Michigan Tech's campus.

Funds for Phase II of this Building the ENGIN project were approved by the Director and Executive Committee after Dr. Jeon delivered a successful year one project report. The second year funds of \$20,000 were transferred to Dr. Jeon for continuation of the initiative in 2016.

Year one of major initiative funding was also awarded to **Amlan Mukherjee** in the amount of \$35,000 for the project "Exploring the Science of Sustainability: Robustness and Resilience of Coupled Infrastructure and Natural Networks". The plan for the proposed multi-disciplinary initiative is to follow three distinct components:

1. Research – bring together a group of interdisciplinary researchers at Michigan Tech to support initial investigations that will help seed a center of exceptional caliber that allows Michigan Tech to compete nationally.
2. Application – the proposed initiative expects to leverage a network of industry and agency stakeholders to develop best practices. Michigan Tech's academic participants will lend expertise while collaboratively engaging industry and agency stakeholders in the problem solving process.
3. Education – the initiative is aimed at furthering and supporting inter-disciplinary curricula at Michigan Tech reflecting the interdisciplinary experiences of the researchers to enhance existing undergraduate classes in transportation design and planning, life cycle analysis, systems engineering and data and information engineering.

Dr. Mukherjee has two papers in process for submission to the Journal of Life Cycle Assessment which will be presented in the summer of 2016 to the Society for Eco-Toxicology and Chemistry and the Eurobitume 2016 conferences.

Several collaborative proposals were submitted with Dr. Mukherjee serving as Michigan Tech PI on two proposals. In addition, Dr. Mukherjee will assist as Co-PI on three additional projects submitted by Michigan Tech upon acceptance by sponsor. Mukherjee led proposals include:

- NRT-Data Enabled Science and Engineering: An Entrepreneurial Model to Deliver a Graduate Program in Data Enabled Infrastructure Systems Engineering to the National Science Foundation. Status: Pending
- Sustainable Highway Construction Practices, in collaboration with the University of Washington to the National Cooperative Highway Research Program. Status: Awarded

A mini-workshop was hosted in Lansing, MI for the Michigan Department of Transportation titled Sustainability Workshop for DOT Engineers and organized by Dr. Mukherjee. As a deliverable of this MTTI funded project, Dr. Mukherjee plans to organize an on campus Workshop to Address Data Needs to Support Sustainable Decision Making Infrastructure in September 2016.

A class on Life Cycle Engineering for Infrastructure Systems was developed and offered at both the undergraduate level (CE4990) and graduate level (CE5390). The class will continue to be offered each spring.

Dr. Mukherjee's deliverables to the project were delayed by a one year sabbatical in Washington, DC. Phase II funding has not yet been awarded.

SEED FUNDING

Zhen Liu and Qingli Dai received seed funding of \$10,000 for their project titled Development of Advanced Ultrasonic Techniques for Air Void Size Distribution in Early-Age and Hardened Concrete. Seed funding projects require a 1:1 match by researchers. Deliverables of the proposal included: 1. two proposal submissions to the National Cooperative Highway Research Program (NCHRP) program and 2. two research papers to describe the durability evaluation with air void measurement and the evolution of air void distribution from fresh to hardened concrete.

Drs. Liu and Dai submitted two proposals to the NCHRP IDEA program of which one was rejected and the "Developing Ultrasonic Scattering Techniques for Air Void Measurement of Early-Age and Hardened Concrete" proposal is pending. In addition, two journal papers have been published with a third under review, one conference paper was also published and conference presentations were made in China, Kansas and Illinois. Cost share was provided by the PI startup and REF seed grant funds.

Dave Nelson was awarded a \$10,000 project to develop a program to investigate driver behavior at highway-rail grade crossings using Naturalistic Driving Study (NDS) data in comparison to simulated driver behaviors. The NDS work and simulator validation is expected to enhance Michigan Tech's position in this growing field allowing us to develop new driver simulator research topics of interest to external funding agencies. This research effort is closely aligned with the driving research being developed in the Department of Cognitive and Learning Sciences by Dr. Philart Jeon. This project was awarded in late fiscal year 2015. Results and deliverables are expected in 2016. Nelson's project also requires a 1:1 cost share match.

In support of on-campus activities, MTI was a sponsor of the Keweenaw Research Center led **SAE Clean Snowmobile Challenge** for the seventh year, providing funding to offset costs of the event.

The Rail Transportation Program website was updated to reflect current university standards. MTI supported the design, development and implementation by an internal IT technician in the amount of \$4,000.

Additionally, MTI supported renovation costs (\$60,000) for the expansion of offices and workstations necessary for the increased workforce of the **Center for Technology &**

Training (CTT). Numerous classrooms, labs and storage areas are currently under construction with completion of the new workspace expected in fall 2016.

OUTREACH

MTTI supports members financially through participation in external organizations allowing researchers a public platform to showcase research and to encourage future collaborations.

MTTI funded membership to the **American Public Transit Association (APTA)** for all members in 2015. APTA is highly involved in advocacy, education, and research to strengthen and improve public transportation. Because APTA requires membership for white paper submissions, conferences, committees and webinars, MTTI's affiliation with the organization provides an additional avenue for transportation activities including networking, research, and educational and professional development opportunities.

The **Council for University Transportation Centers (CUTC)** is comprised 93 of the nation's leading university transportation centers (UTCs), organized to exchange information on issues affecting the UTC's and to provide a collaborative resource to universities to increase their role in transportation research, education, and technology transfer. Michigan Tech has had a continuously sponsored University Transportation Center since 2006. In addition, five internal proposals were submitted recently for the current UTC request for proposal. Membership and participation in CUTC continues to benefit the membership of MTTI.

MTTI was previously a member of the Transportation and Engineering Road Research Alliance which was replaced in July 2015 by the **National Road Research Alliance (NRRR)**. MTTI membership continues with NRRR with the primary role as advisors and to provide long-term technical support to the implementation and development of full research projects. The NRRR has set up a pooled fund for research with sponsorship from the five state DOT's: Illinois, Michigan, Minnesota, Missouri and Wisconsin. **Ralph Hodek** serves as the MTTI representative to the NRRR with **Jake Hiller** serving on the Flexible Pavement Team and **Zhanping You** on the Rigid Pavement Team.

EDUCATION

Joan Chadde, Director of the **Michigan Tech Center for Science & Environmental Outreach (SEO)**, facilitates K-12 STEM and environmental education for students and teachers. MTTI financially sponsored three events for the SEO in 2015:

- The "Taste of Tech 3 Day Spring Break Camp" was offered on campus to students in grades one through six as an opportunity to learn about science and engineering with a hands-on approach to projects such as designing bridges, making ice cream out of liquid nitrogen, testing a driving simulator or racing their

Lego designed rail cars on a Maglev track. In addition, visiting professional engineers provided engineering and science talks designed to provide students with an idea of what careers they could start to think about. MTI sponsored luncheons for the 15 students.

- Twenty Detroit area high school students visited Michigan Tech's campus for a five day program provided by Joan Chadde and the SEO. Students explored careers in natural resources, environmental science and engineering while experiencing college life by staying in the Wadsworth Residence Hall and eating in their café. The program schedule included identification of trees, measuring of forest plots, a 4-hour Great Lakes investigation aboard the Agassiz, health assessment of local streams and operating underwater autonomous vehicles. Numerous Michigan Tech offices contributed to the program allowing the students to receive free transportation, food and lodging while on campus. MTI provided financial support to the program.
- Joan Chadde, in collaboration with the Michigan Department of Transportation, also hosted a workshop which provided area teachers with curriculum-enhancing, hands-on lessons and tools for math, science, engineering, and social science classes through the **Transportation and Civil Engineering (TRAC)** program. The American Association of State Highway Transportation Officials (AASHTO) program is provided to teachers and students of Michigan middle and high schools and is designed to engage students in civil engineering projects to solve real-world problems such as designing bridges, building magnetic-levitation trains or roadway and construction design. MTI provided financial support to the workshop.



**AT LEAST 20% OF THE
HIGH SCHOOL
PARTICIPANTS SAID THEY
ARE INTERESTED IN
RETURNING TO MTU AS
STUDENTS**

MTI helps to engage the next generation of the transportation workforce through two summer camps. Michigan Tech has hosted a **National Summer Transportation Institute (NSTI)** program through the FHWA and with support from MDOT since 2009. The class is a two week residential program for 30 high school students with a core curriculum based on the TRAC program. All seven TRAC modules are used in NSTI classrooms and reinforced on field trips and with guest speakers. MTI has been involved in the planning and support of NSTI since the onset of the program.

MTI also supports the Rail Transportation Program's **Rail and Intermodal Transportation Summer Youth Program**. The week-long event for high school students includes interactive classroom activities and guest speakers along with a host of field trips to rail

facilities and intermodal sites. Students learn how ballast affects rail stability, how to operate a computer locomotive simulator and investigate logistics management operations. Partially sponsored by the University of Wisconsin-Superior, field visits include sites in Michigan, Wisconsin and Minnesota. MTI continues to be involved in the planning and support of this program.

PROPOSAL SUPPORT

MTI offers pre-award and proposal preparation support for all investigators. In instances of required cost sharing by a sponsoring entity, MTI will also provide hard dollar funding to aid in meeting the requirements of the match.

In response to a request for proposal by the Environmental Protection Agency for the EPA Environmental Finance Center for the Great Lakes Region (EPA Region 5), MTI combined workforces with the **Center for Technology & Training** and the **Tribal Technical Assistance Program (TTAP)** in the proposal submission process, including \$5,000 in support of labor costs. The project includes researchers from Civil and Environmental Engineering (CEE), School of Business and Economics (SBE), and Chemical Engineering. MTU was awarded the \$4.8 million, 6 year project in August 2015.

Dr. Zhanping You (CEE) submitted a proposal to the Michigan Space Grant Consortium titled "How will Pavement Materials Perform on Mars?" which required a 1:1 direct dollar match of \$5,000. MTI provided the cost share portion for the project, which is pending.

Continued financial support of **Thomas Oommen's** (GMES) two projects "Sustainable Geotechnical Asset Management along the Transportation Infrastructure" with the USDOT and "Remote Sensing Based Assessment System for Evaluating Risk to Transportation Infrastructure Following Wildfires" with the University of Arkansas provided cost share funding in the amount of \$11,200.

CONFERENCES & WORKSHOP TRAVEL

MTI researchers and students contribute to the growth of the transportation profession by participating in and leading local, state, and national organizations. MTI provides a \$500 travel stipend to members for conference, meeting or workshop participation. In 2015, travel funding was provided to:

- **Yue Li** (CEE) attended a meeting at University of Illinois-Chicago to explore international collaborative research opportunities in Design and Construction of Sustainable Built Environments.
- **Thomas Oommen** (GMES) presented on the commercialization of his USDOT RITA project output to benefit transportation agencies in Oklahoma City, OK.
- **Larry Sutter** (MSE) chaired and served on numerous committees at the American Concrete Institute fall meeting in Washington, DC.

- **Stan Vitton** (CEE) traveled to Fairbanks, AK for a presentation at the APCOM 2015 Conference.
- **Qingli Dai** (CEE) presented three papers at the ASCE EMI conference and attended committee meetings at McMaster University in Canada where she met with researchers in the Ministry of Transportation of Ontario.
- **Zhanping You** (CEE) was invited to attend the 9th International Conference on Road and Airfield Pavement, China to meet researchers on low emission asphalt opportunities.
- **Richard Dobson** (MTRI) attended the Structures Congress in Portland, Oregon for a presentation “Assessing Bridge Condition Using Unmanned Aerial Vehicles”.
- **Kuilin Zhang** (CEE) presented a paper “Optimizing Multi-Layer Merge-in-Transit Supply Chains” at the 2015 Transportation Research Board annual meeting in Washington, DC.
- **Tess Ahlborn** (CEE) was an attendee of the Concrete Canoe Competition and American Concrete Institute in Kansas City, MO as the 239 Committee Chair.
- **Myounghoon Jeon** (CLS) organized a workshop and presented “Regulating Drivers’ Aggressiveness by Sonifying Emotional Data: Subjective Assessment of In-vehicle Auditory Warnings for Rail Grade Crossings at the International Conference on Auditory Display in Graz, Austria.
- **Hamed Pouryousef** (RTP) attended the 2015 Transportation Research Board annual meeting in Washington, DC for a presentation titled “Capacity Evaluation of Directional and Non-directional Operational Scenarios along a Multiple-track US Corridor”.
- **Chris Gilbertson** (CTT) was an invited participant in the MDOT Research Summit held in Lansing, MI.
- **Tim Colling** (CTT) participated in the 2015 NLTAPA Winter Business Meeting in Washington, DC as a Transportation Research Board ABN25 committee member.
- **Tim Havens** (ECE) attended the Big Data in Railroad Maintenance Planning at the University of Delaware.

In addition to member stipend travel, MTTI supported **Jonathon Riehle** (Engineering Fundamentals) for \$1,000 of travel costs associated with his participation in the ENO Center for Transportation Leadership at the Leadership Development Conference.

Jake Hiller attended the TERRA Innovation Series and annual board meeting in Madison, WI on behalf of MTTI.

In FY15, **Director Hodek** represented MTTI at the Intelligent Transportation Systems 21st World Congress in Detroit, MI where he networked with MDOT Director Kirk Steudle. In addition, Hodek participated in the MDOT sponsored Research Summit in Lansing, MI and represented MTTI at the NRRRA annual meeting in Minneapolis, MN.

INVITED SPEAKERS

Matt Smith, Intelligent Transportation Systems (ITS) Program Manager at the **Michigan Department of Transportation (MDOT)** presented a report on "Intelligent Technology in Transportation" to the CEE graduate seminar class at Michigan Tech in September 2015. A MTI sponsored social reception was held following the presentation for members, students and campus personnel. Smith is an alumnus of the Civil Engineering Department at Michigan Tech.



ACCOMPLISHMENTS

RESEARCH

Proposal requests by MTI researchers to multiple funding agencies totaled **\$20,304,021** in FY15. Total project values, including committed cost share funding, equaled **\$21,315,035**. Of the **62** proposals submitted, **28** projects were successfully funded with an approval rate of **45%**, awarding MTU with **\$4,497,845** in research funding. MTI currently has **47** proposals which remain in pending status or are currently underway. Figure 5 provides a review of proposals, awards and on-going projects over the previous five fiscal years. Annual proposal submission values are depicted in Figure 6 with total research funding awarded to MTU through MTI sponsored projects shown in Figure 7. All charts are for the time period FY11-FY15.

Proposals, Awards and OnGoing Projects

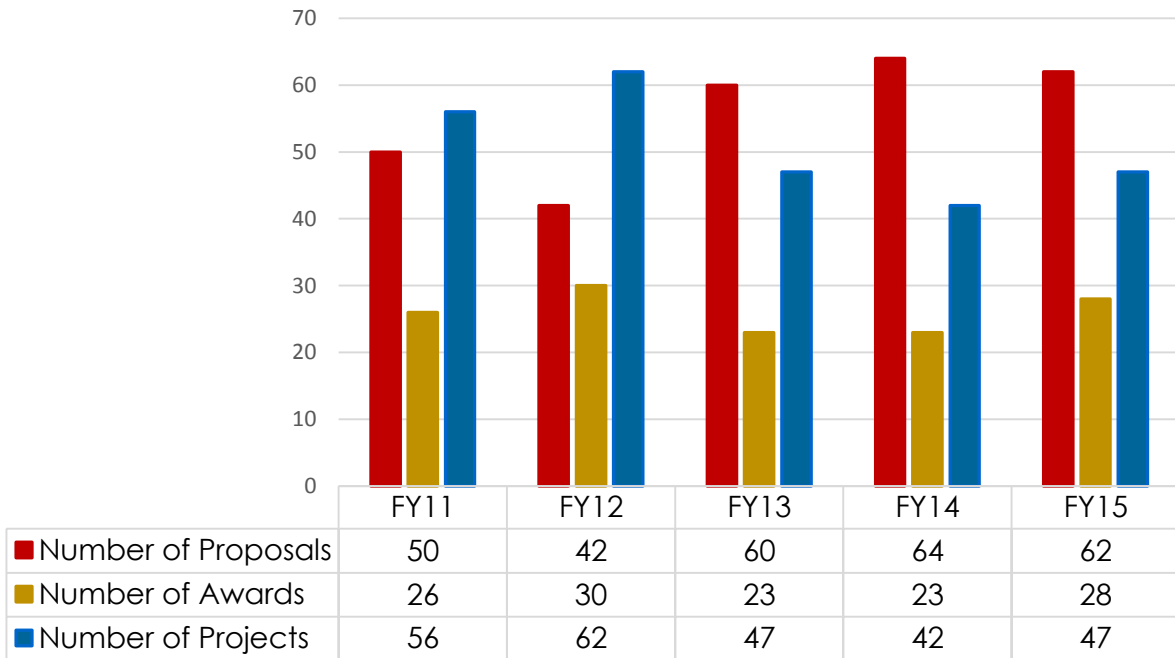


FIGURE 5: PROPOSALS, AWARDS AND ONGOING PROJECTS

Proposal Submissions

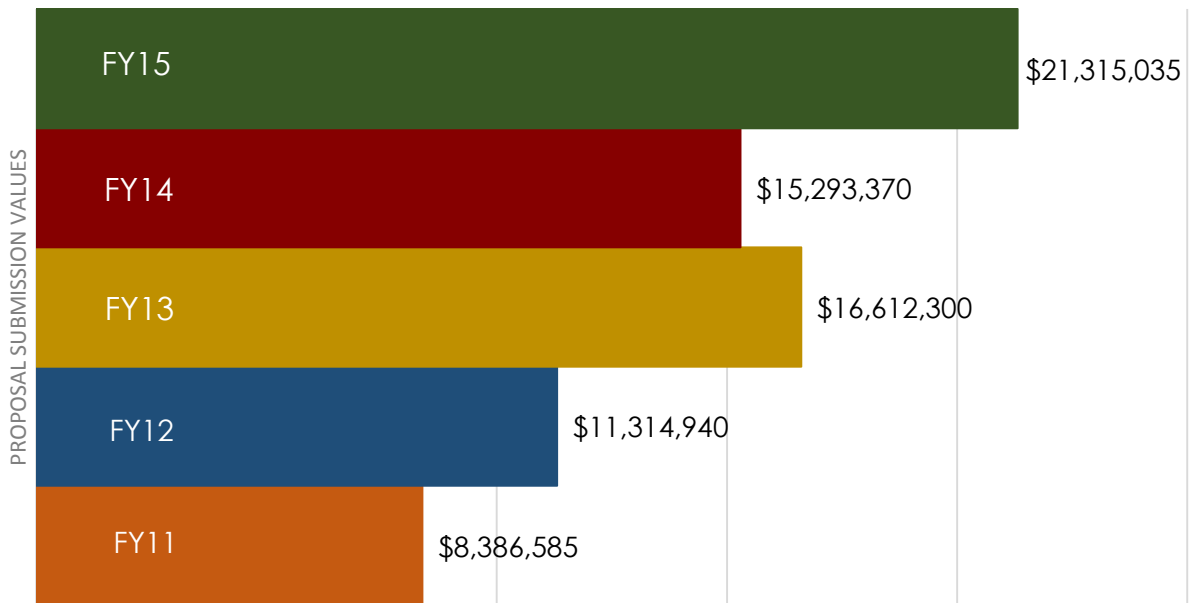


FIGURE 6: PROPOSAL SUBMISSIONS

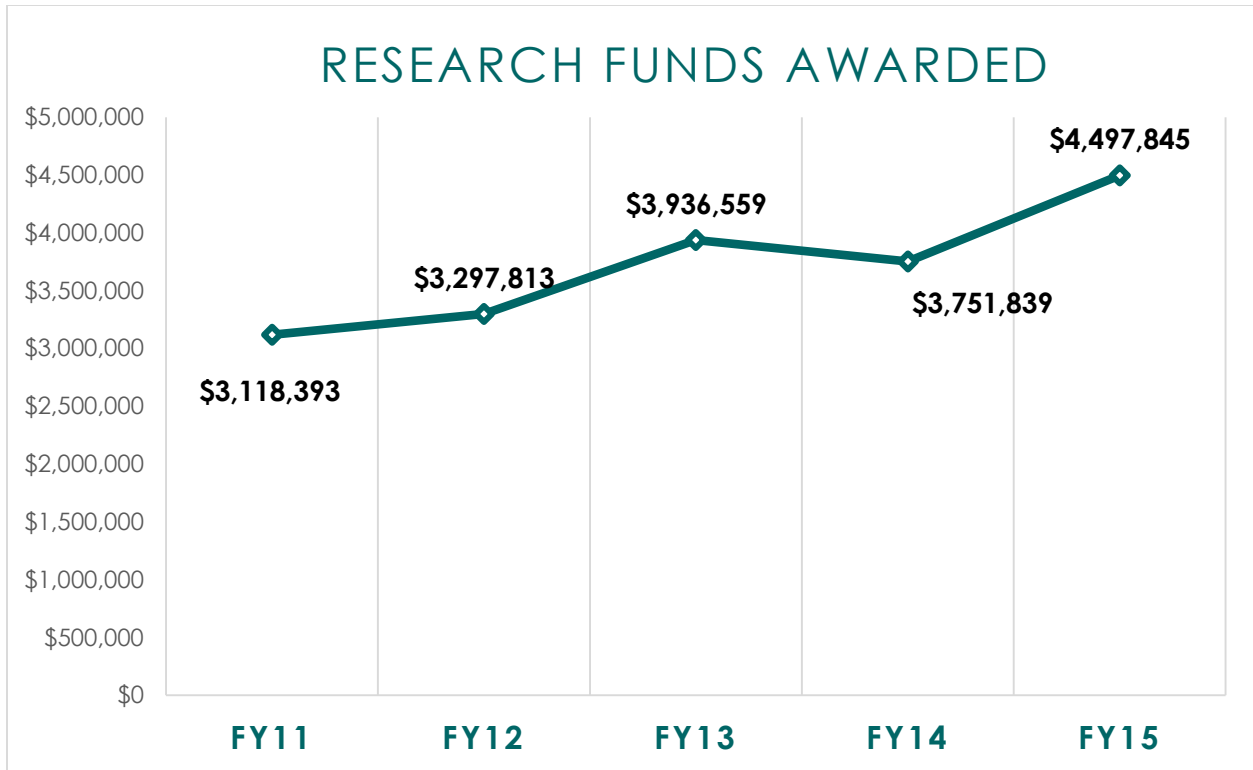


FIGURE 7: RESEARCH FUNDS AWARDED

INSTITUTE

MTI continued to support growth and development of transportation on campus with funding in support of members and by provided networking opportunities with invitations to industry leaders for campus visits.

Numerous youth programs were sponsored in an effort to support workforce development and increase educational awareness of the transportation industry and career options available.

Letters of support were issued on behalf of researchers in their quest for research funding or participation in leadership conferences.

Outreach continued with participation in the CUTC and NRRRA meetings with increased involvement in committees.

An effort at inclusion of most researchers on campus resulted in an increased recognition of MTI membership advantages and in an environment of teamwork and collaboration.

MTI will continue to recognize and support members and to increase awareness of the institute. MTI membership has expanded across campus to include researchers in a

majority of departments and institutes/centers at MTU. Current MTI membership is listed below.

Civil and Environmental Engineering (CEE)

Tess Ahlborn, Professor
Brian Barkdoll, Professor
Jennifer Becker, Associate Professor
Qingli Dai, Assistant Professor
George Dewey, Associate Professor
Dave Hand, Department Chair
Jake Hiller, Associate Professor
Ralph Hodek, Associate Professor/Director
MTI
Zhen Liu, Assistant Professor
Amlan Mukherjee, Associate Professor
Eric Seagren, Professor
Bill Sproule, Professor
Andrew Swartz, Assistant Professor
Stan Vitton, Associate Professor
Dave Watkins, Professor
Veronica Webster, Associate Professor
Pengfei Xue, Assistant Professor
Zhanping You, Professor
Kuilin Zhang, Assistant Professor

Center for Technology and Training (CTT)

Chris Codere, Senior Project Manager
Tim Colling, Director
Chris Gilbertson, Senior Research Engineer I
John Kiefer, Research Engineer II
Nick Koszykowski, Principal Programmer
Luke Peterson, Principal Programmer
Gary Schlaff, Senior Project Manager

Rail Transportation Program (RTP)

Pasi Lautala, Director RTP/Assistant Professor
(CEE)
Dave Nelson, Senior Research Engineer

Michigan Tech Research Institute (MTRI)

Don Atwood, Senior Research Scientist
Colin Brooks, Senior Research Scientist
Rick Dobson, Assistant Research Scientist
Liza Jenkins, Research Scientist II
Chris Roussi, Senior Research
Scientist/Engineer

Biological Sciences (BS)

Rupali Datta, Associate Professor

Biomedical Engineering (BME)

Keat Ong, Associate Professor

Center for Science and Environmental Outreach (CSEO)

Joan Chadde, Director

Chemistry

Shiyue Feng, Professor
Pat Heiden, Professor

Cognitive and Learning Sciences (CLS)

Kedmon Hungwe, Associate Professor
Myounghoon Jeon, Assistant Professor

Computer Science (CS)

Laura Brown, Assistant Professor
Nilufer Onder, Associate Professor

Electrical and Computer Engineering (ECE)

Zhuo Feng, Associate Professor
Tim Havens, Assistant Professor
Chee-Wooi Ten, Assistant Professor

Geological and Mining Engineering and Sciences (GMES)

Thomas Oommen, Associate Professor

Humanities (HU)

Ann Brady, Professor
Karla Kitalong, Professor

Keweenaw Research Center (KRC)

Russ Alger, Director, Snow Institute

Materials Science and Engineering (MSE)

Jerry Anzalone, Lab Supervisor/Research
Scientist I
Paul Sanders, Associate Professor
Larry Sutter, Professor

Mathematical Sciences (MS)

Jianping Dong, Professor

Jon Leinonen, Mentor in Residence

Paul Nelson, Associate Professor

Mechanical Engineering-Engineering**Mechanics (ME-EM)**

Ye Sun, Assistant Professor

Social Sciences (SS)

Donald LaFreniere, Assistant Professor

School of Business and Economic (SBES)**Tribal Technical Assistance Program (TTAP)**

John Velat, Director

SPACE AND FACILITIES REQUIREMENTS

MTTI facilities continue to consist of three offices for research development, a multi-media conference room equipped with state of art technological communication equipment for webinar broadcast and a computing laboratory and library for student activities. The CTT has expanded their workspace with renovation of Dillman classrooms, labs and storage areas with MTTI funding. No additional facilities are required by MTTI at this time. Future needs may include additional space should MTTI hire a technical editor for update of website and production of promotional items.

FUTURE PLANS AND GOALS**OPERATIONAL**

A strategic plan for future use of MTTI funds will be developed in conjunction with the Executive Committee. New goals will be researched for the next fiscal year including financing of new major initiatives. Cross disciplinary relationships will continue to be executed and partnerships with other Michigan Tech centers and institutes increased.

OUTREACH

Plans for a potential speaker series with invited guests will be discussed. MTTI will extend their network email list to include external sources for potential collaboration and networking. MTTI will examine other external memberships to fund for showcase and collaboration of MTTI researchers and will increase involvement with NRRRA and CUTC.

TECH TRANSFER

With the inclusion of additional researchers, departments, and facilities by new MTTI members, an update of the website is a necessity. Promotional material will be more of a priority for the institute.

SUMMARY

Over the past few years, the atmosphere in MTI has strengthened into a collaborative, teamwork type of environment under the leadership of Director Hodek and the elected Executive Committee. New cross disciplinary members continue to join the institute and current members seek to enhance their research capabilities with MTI support. In review of FY15, MTI succeeded in supporting the institute mission:

- increased support of membership and research activities through initiative opportunities, proposal support, educational programs and outreach through workshops, conferences and campus speakers
- expanded MTI membership to include multiple new departments, centers and institutes on campus
- provided members with external opportunities to showcase expertise and network with new collaborators

MTI continues to strengthen and expand the institute, “partnering for the future of transportation” and successfully fulfilling MTI’s vision statement.

APPENDIX A: MTTI PROPOSAL SUBMISSIONS 2015

The table provides an overview of all proposals submitted with MTTI as the listed institute during 2015. Proposal submission may have a lag time of nearly one year before status of a project is known. Pink shading denotes FY14 submissions; orange denotes FY15.

Proposal #	Submitted	PI	CoPI	Sponsor	Title	Amount Requested	Status
1501005	1/13/2015	M. Jeon		Nine Sigma	Sonic Information Design for Intuitive In-vehicle Interactions	\$35,443	Awarded
1501031	1/15/2015	M. Jeon		NSF	Auditory Interactions as Countermeasures Against Aggressive Driving	\$500,000	Declined
1306033	2/3/2015	J. Velat		FHWA	TTAP	\$150,000	Awarded
1502022	2/16/2015	J. Velat		FHWA	Applying Ethnographic Methods to Improve Traffic Safety Data on Rural and Tribal Roadways	\$18,602	Declined
1502033	2/17/2015	Q. Dai		NSF	Controllable Foaming and Compaction Processes for Improved WMA Mixtures	\$312,191	Declined
1502035	2/17/2015	K. Zhang	C. Brooks	NSF	Improving Spatial Observability of Dynamic Systems through Ubiquitous Sensor Networks	\$200,000	Awarded
1502045	2/25/2015	Q. Dai		NSF	Advance Degradation Model with Fundamental Characterization and Validation for Nuclear Concrete under Combined Nuclear Radiation and Environmental Loadings	\$799,999	Declined
1302081	3/9/2015	P. Lautala	P. Sanders, T. Havens, T. Oommen, M. Jeon	UIUC	NURail Tier I	\$124,996	Awarded
1503020	3/11/2015	Z. You	D. Porter	TRB	An Innovative Compactor for Asphalt Mix Design	\$149,999	Declined
1503017	3/11/2015	Q. Dai	L. Zhen, Y. Sun	TRB	Developing UltraSonic Scattering Techniques for Air Void Measurement of Early Age Hardened Concrete	\$149,999	Declined
1411064	3/16/2015	T. Oommen		Univ of Mich Space Grant	Monitoring Hazard for Critical Infrastructure from Increased Seismic Activity in or Near Injection Wells	\$15,539	Awarded
1503038	3/20/2015	T. Oommen	Brooks, Atwood, Jenkins, Lautala	NASA	The Interaction of Northern Ecosystems and Transportation Networks in an Era of Changing Climate	\$507,331	Declined
1503048	3/24/2015	A. Swartz		University of CA-Davis	Wireless Intelligent Nanocomposite Garment (WING)	\$200,000	Pending
1503011	3/25/2015	J. Velat		Lac Court Oreilles	TTAP	\$15,726	Awarded
1503074	4/1/2015	Q. Dai		MDEQ	Recycling and Surface Coating of Cathode Ray Tube Glass as Fine Aggregates in Cement Mortar and Concrete	\$161,030	Declined
1504010	4/2/2015	K. Zhang		University of WA	Transactive Traffic Demand Management (TTDM)	\$421,052	Pending
1504012	4/7/2015	K. Zhang		University of WA	Control of Shared Use Vehicles to Minimize Single Occupance Vehicle Travel	\$290,526	Pending
1504030	4/14/2015	Z. Liu	L. Brown, K. Hungwe, G. Shankara	NSF	Computer Cluster Centered Classroom Environment for Courses Related to Numerical Analysis	\$681,429	Declined
1210003	4/28/2015	Z. You	P. Heiden	NSF	Fundamental Understanding of Foaming Process towards a New WMA Technology	\$10,000	Addl Funding
1504050	5/1/2015	T. colling	J. Velat, J. Leinonen, E. Seagren, J. Becker, T. Merz, D. Hand, R. Hodek, Nelson, Handler	EPA	EPA Environmental Finance Center for Great Lakes Region	\$4,727,879	Awarded
1505005	5/5/2015	K. Zhang		NSF	An Integrated Modeling Framework of Informaion and Vehicular Traffic in a Connected Driving Environment	\$299,257	Declined
1505054	5/21/2015	T. Havens	T. Oommen	NSF	BigData: Collaborative Research: Geohazards Assessment & Rescue & Relief Planning Using Heterogenous Big Data Analytics	\$740,691	Declined
1505061	5/28/2015	Q. Dai	A. Sorteboom	Umich MSGC	Smart Flap Actuator Design Vibration Reduction for Aerospace Structures	\$2,500	Awarded
1306033	6/12/2015	J. Velat		FHWA	TTAP	\$140,000	Addl Funding
1506046	6/30/2015	T. Colling	J. Kiefer, C. Codere	MDOT	2016 LTAP	\$512,474	Awarded
1506048	6/30/2015	J. Velat	Sproule, Brady, Lighthizer, Jeon, Kitalong, Lafreniere, Nelson, Sun, Schlaff	MDOT	Association of Michigan's Older Adult Crashes with Roadway Features	\$513,738	Declined
1506047	6/30/2015	Z. You		MDOT	Evaluating Road Delineation Practices in Michigan	\$199,240	Declined

1507033	7/20/2015	Q. Dai		NSF	CAREER: Multiscale Mechanical & Thermal Properties	\$672,632	Declined
1302081	7/20/2015	P. Lautala	Sanders, Havens, Oommen, Jeon	UIUC	NURail Tier I	\$111,149	Awarded
1207052	7/21/2015	T. Ahlborn	C. Brooks	MDOT	Evaluation of Bridge Decks Using NDE	\$154,243	Addl Funding
1508007	8/6/2015	P. Lautala	D. Nelson, M. Jeon	FHWA	Research Utilizing the SHRP2 Safety Data to Support Highway Safety	\$124,806	Declined
1508019	8/13/2015	T. Colling	J. Keifer, C. Gilbertson	MDOT	2016 TAMC Education Work Program	\$176,133	Awarded
1508021	8/14/2015	C. Gilbertson	A. Barajas	MDOT	Update TRAC Program	\$81,614	Awarded
1110099	8/18/2015	J. Chadde		CFIRE	CFIRE UTC	\$20,199	Addl Funding
1508031	8/24/2015	J. Velat	D. Nelson, S. Bershing	MDOT	Research Program Services	\$696,496	Declined
1306033	9/11/2015	J. Velat		FHWA	2015 National Tribal Transportation Conference	\$24,994	Awarded
1509023	9/11/2015	S. Bershing		Lac Court Oreilles	WI InterTribal Task Force Survey	\$6,513	No Response from Sponsor
1507037	9/15/2015	T. Colling	J. Kiefer	MDOT	TAMC 2016	\$99,980	Awarded
1509045	9/15/2015	Z. Liu	P. Xue, J. Meldrum, Vitton	NSF	Scientific Understanding of Mine Water as a Geotherma Resource	\$449,743	Pending
1509038	9/15/2015	Z. Liu		NSF	Exploratory Investigation into Multi-Scale Multiphysics for Thermally Induced Water Flux	\$96,751	Awarded
1509049	9/16/2015	J. Velat	A. Kerttu	MNDOT	MNTTC 2015	\$18,000	Awarded
1509036	9/16/2015	Q. Dai		NSF	CR: Optimal Internal Curing in Concrete Using Engineered Cenospheres	\$165,806	Declined
1509034	9/16/2015	T. Oommen		NSF	Advancing Landslide Life Cycle Monitoring & Prediction Using Satellite Remote Sensing	\$390,167	Declined
1509082	9/29/2015	T. Colling	Schlaff, Peterson, Koszykowski	MDOT	RoadSoft Asset Management System Development & Support	\$759,392	Awarded
1509084	9/29/2015	T. Colling	Koszykowski	MDOT	2016 MERL Development & Support	\$116,453	Awarded
1510026	10/15/2015	Z. Liu		American Chemical Society	Scientific Understanding of Phase Interaction Multiphase Porous Materials Using Particle Hydrodynamics	\$146,451	Pending
1510060	10/27/2015	L. Sutter	Z. You	MDOT	TMRC	\$54,495	Awarded
1510070	10/29/2015	Z. You		MDEQ	Foamed Rubber Asphalt Overlay Construction with Recycled Subbase	\$1,264,008	Pending
1510072	10/29/2015	Q. Dai	Z. You	MDEQ	Development and Field Application of Fiber Reinforced Concrete with Increased Rubber Particle Content and Fibers Recovered from Waste Tires	\$765,036	Pending
1510073	10/29/2015	X. Tian	Z. You, Q. Dai, D. Porter, X. Yang	MDEQ	Tire Rubber Modified Asphalt Emulsion for Pavement Preservation	\$1,193,624	Pending
1510068	10/30/2015	P. Lautala		Prime Focus LLC	Asset Management Strategies for Maintenance and Preservation of New City Interpassenger Car Fleet	\$41,000	Declined
1302081	10/30/2015	P. Lautala		UIUC	NURail Tier I	\$58,200	Addl Funding
1311077	11/2/2015	K. Zhang	Y. Li	University of Chicago	Coordinated Transit Response Planning and Operations Support Tools for Mitigating Impacts of All Hazard Emergency Trends	\$180,009	Pending
1511059	11/16/2015	Z. You	J. Chen, H. Yao	MSGC	How Will Pavements Perform on Mars?	\$15,500	Declined
1511091	11/24/2015	C. Gilbertson	B. Bulleit, N. Koszykowski	MDOT	Developing Representative Michigan Truck Configurations for Bridge Load Rating	\$313,751	Declined
1511092	11/24/2015	C. Gilbertson	Torola	MDOT	Evaluation of Costs/Benefits of Standardization of Secondary Route Bridges	\$880,972	Declined
1511081	11/24/2015	T. Ahlborn	A. Mukherjee, C. Brooks, R. Sawtell	MDOT	Development of 3D & 4D Bridge Model Plans	\$414,785	Declined
1511094	11/24/2015	C. Brooks	T. Ahlborn, A. Mukherjee, K. Zhang, T. Havens, T. Oommen	MDOT	Implementation of UAVS for Assessment of Traffic Infrastructure	\$598,526	Awarded
1511090	11/24/2015	K. Zhang		MDOT	An Evaluation of Michigan's CCC Distribution	\$85,888	Declined
1512010	12/9/2015	A. Mukherjee	Steelman, Lautala, Swartz, Webster, Helsel, Onder, Raber, Rouleau	NSF	NRT NESE: An Entrepreneurial Model to Deliver a Graduate Program in Data Enabled Infrastructure Systems Engineering	\$3,000,000	Pending
1512025	12/15/2015	T. Colling	C. Codere	MDOT	Traffic Engineering Safety for Local/Appointed Officials	\$16,294	Pending
1511098	11/30/2015	L. Sutter	G. Anzalone, J. Pearce	ACI	3D Printing of Concrete	\$77,403	Pending

TABLE 1: LIST OF MTI PROPOSALS SUBMITTED FOR 2015