2017

ANNUAL REPORT

Michigan Technological University

Michigan Tech Transportation Institute

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BY THE NUMBERS

$3,315,179

Research Funding Awarded to MTTI Investigators

47%

Proposal Award Rate

Youth supported for on campus educational activities

60

49

Proposals Submitted

80

MTTI MEMBERS

$120,000

Awarded to MTTI Members for:

- Initiative Funding
- Facility Upgrades
- Travel

2017 Funding Partners

- Engineering & Software Consultants
- Environmental Protection Agency
- Federal Highway Administration
- Federal Railroad Administration
- Michigan Department of Environmental Quality
- Michigan Department of Transportation
- University of Chicago
- University of Washington

The Year in Review

With a newly elected director and executive committee, MTTI's activities in FY17 concentrated on more closely aligning the Institute with its mission and the vision set forth in 2010 of "*partnering for the future of transportation*".

PASI LAUTALA (CEE) was elected as the third director in MTTI history, taking over for the retiring RALPH HODEK (CEE) in November of 2016. New elections were also held for two Executive Committee members in the spring of 2017 for positions beginning in FY18.

Current EC members include:

Principal Members - COLIN BROOKS (MTRI), THOMAS OOMMEN (GMES), STAN VITTON (CEE)

Affiliate Members – CHRIS GILBERTSON (CTT), JAKE HILLER (CEE)

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.

The new leadership was tasked with fulfilling MTTI activities previously identified in the FY 16 annual report to the Vice President for Research (VPR) including:

- Increase participation between institute and members providing more frequent updates on MTTI plans and strategies to make MTTI more transparent and welcoming.
- Implement a student summer research program similar to SURF.
- Continue development of a speaker series to increase number of invited guest speakers to campus.
- Increase funding for minor initiatives to encourage proposal development and return on investment to the institute.
- Make MTTI more visible across campus.
- Revamp and update MTTI website and produce marketing materials for better branding.

One of the first tasks undertaken by the Director was to provide an online survey to MTTI membership for input on better aligning MTTI support and services with the priorities of our members. The survey was also provided in paper format at the MTTI general membership meeting. The brief survey identified six areas of support offered by MTTI and was completed by 25 MTTI members. The key findings, in order of importance to membership, included:

- Pre-award proposal support is considered the most valuable service provided by the MTTI.
- Administrative post award support
- Travel and event support
- Research funding
- Student support
- Other financial support

Complete results of the survey are provided in Appendix B.

Administrative Updates

The original MTTI Charter and Bylaws were incorporated in July 2010. Since that time, the organizational structure of MTTI has vastly changed as have the number of members who are eligible for MTTI membership. Vague and conflicting wording in the documents are being updated as well as new levels of participation being defined. Simplification of the voting procedures are being undertaken and as per the current Bylaws, will be offered to MTTI membership for approval. The updated Charter and Bylaws will be presented to the Vice President of Research Office for approval as well.

A cost share policy was created for all proposals with sponsor mandated cost share requirements submitted to the sponsor by MTTI membership. Previously, MTTI had no formal structure and cost share was granted on an individual basis by the Director. See Appendix C.

A new, easier to manage website has been designed and is under review by the Director and EC before being made public. The site is more dynamic, offers more detailed information and provides easier upgrades and maintenance.

A priority since the transition of the new Director has been increased campus collaboration. MTTI led or collaborated on multiple events including proposal preparation, campus tours, guest speaker invitations, and a mobility summit.

Overall, MTTI has stayed on track and either completed or made progress in most activities identified in FY16 report. A more detailed assessment of this progress is provided later in the report.

Use of IRAD Funds

MTTI is allocated IRAD funding by the Office of the Vice President for Research, used for operating expenses and for strategic investment for membership. MTTI IRAD returns (Figure 1), expenditures (Figure 2), and IRAD balances (Figure 3) are depicted for a five year period from FY13 – FY17. The IRAD returns have been on decline over the past five

years. Over the past two years, the main reason for the decline is the reduction in the IRAD return from projects proposed by the CTT, mainly caused by a formula change. MTTI has also lost some of its past contributors and there are several young faculty on campus who are only ramping up their research programs. It's expected that trend will turn to positive during upcoming fiscal years, both through younger research faculty and through increased attention in attracting new contributors (members). MTTI expenditures have seen some volatility, caused mainly by strategic investments in major initiatives (in FY15) and most recently in CTT facility upgrades (FY17). These investments have brought down the overall MTTI balance by approximately 30% since FY14. Despite the reduction, MTTI's balance is healthy and still has room for strategic investments when opportunities arise.

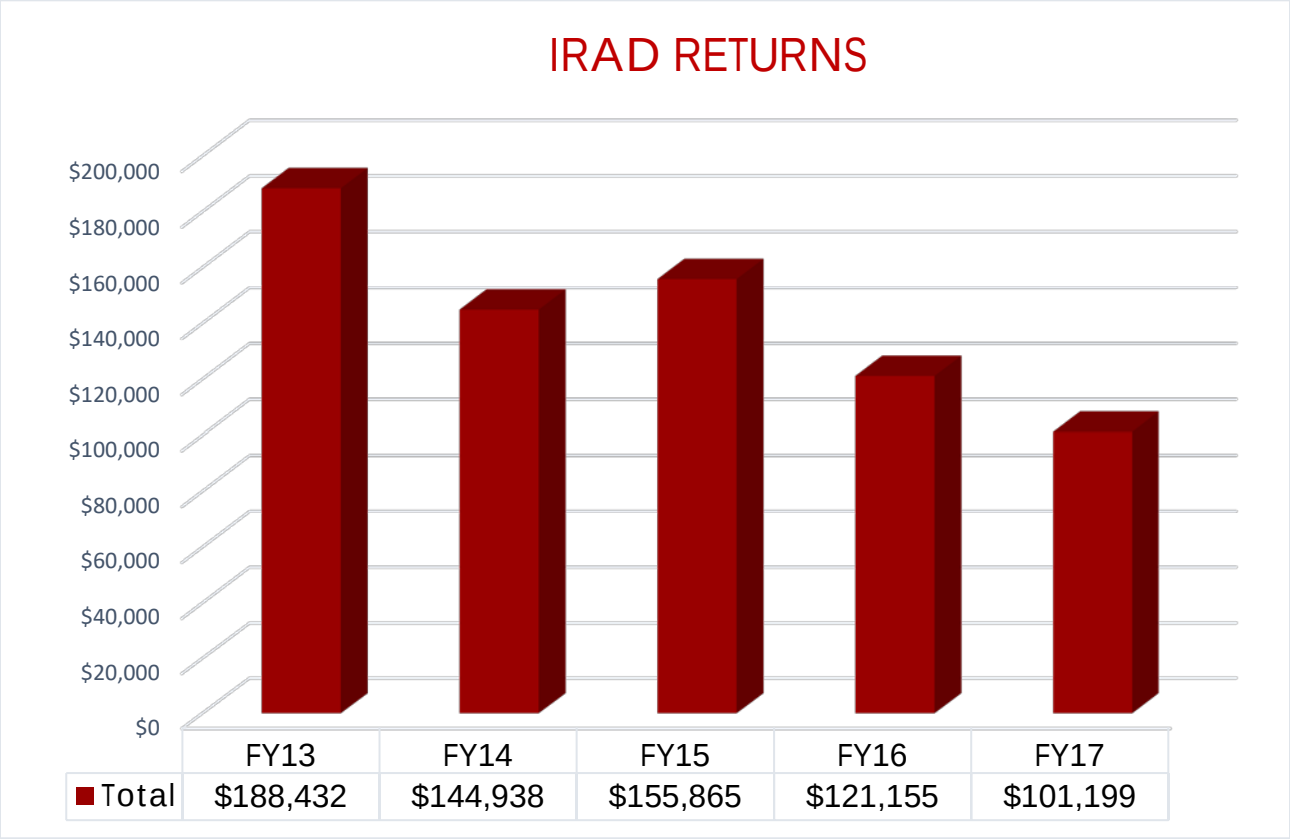


FIGURE 1 MTTI IRAD RETURNS

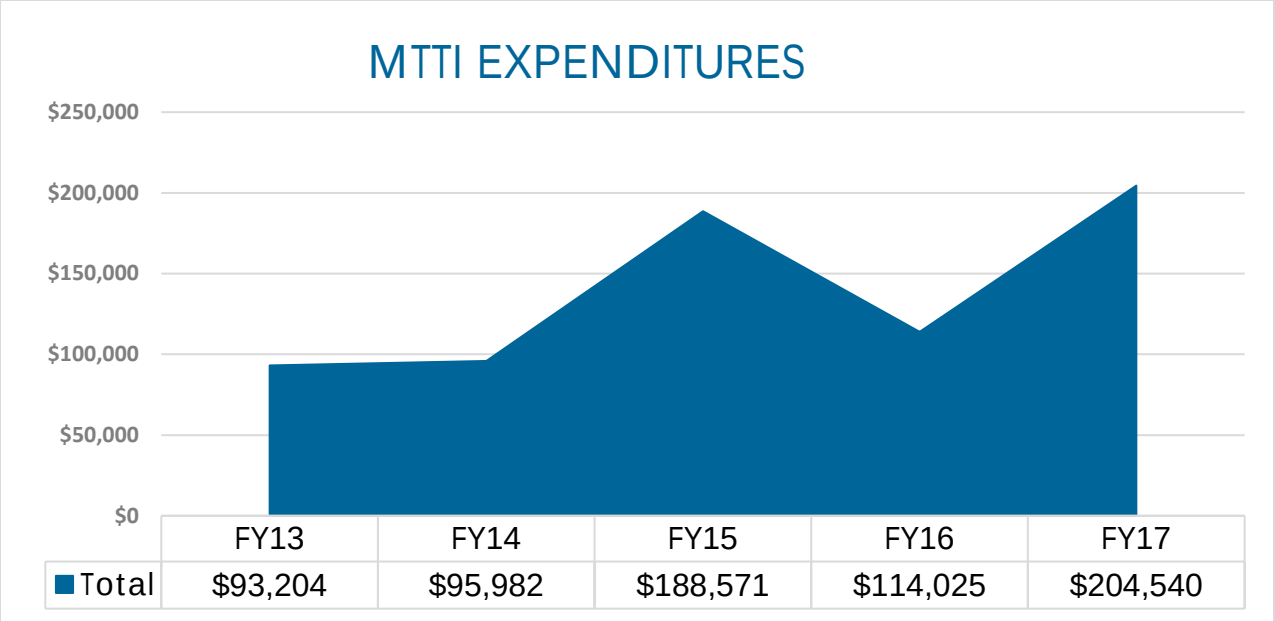


FIGURE 2 MTTI EXPENDITURES

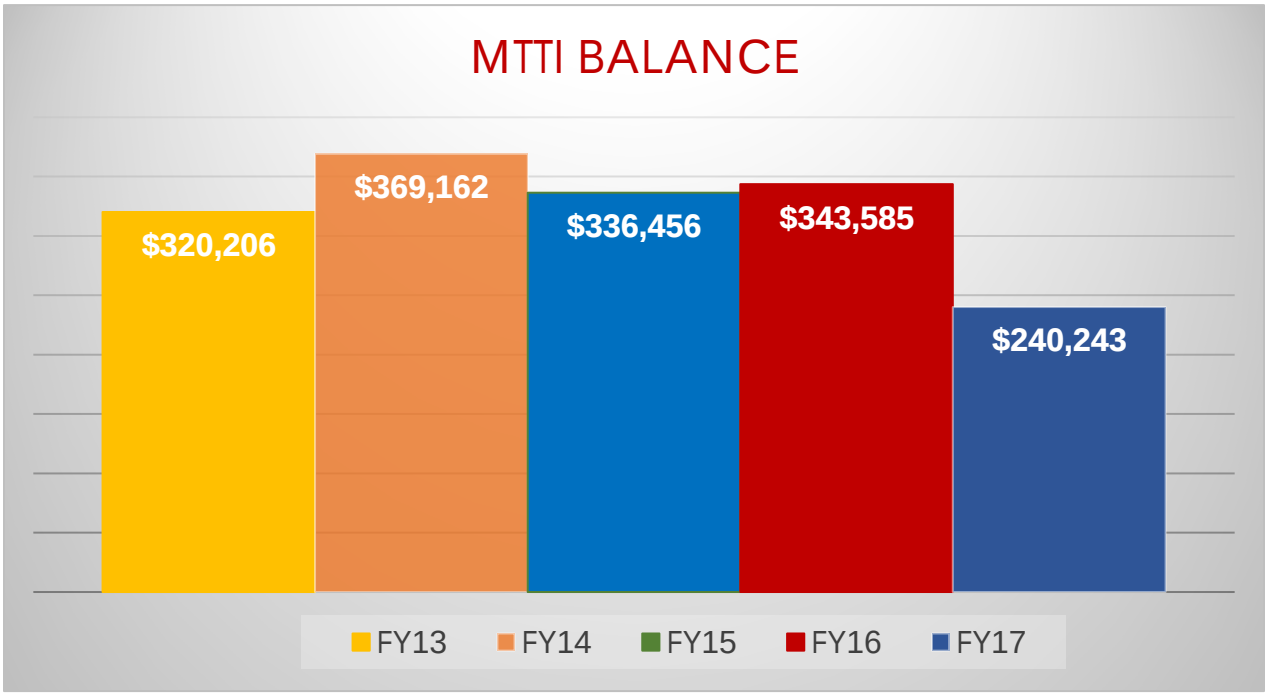


FIGURE 3 MTTI IRAD BALANCE

RETURN ON INVESTMENT

The main priority of the Director and EC in allocating MTTI funds for investments is to increase transportation related research funding in the University. Resources are available to membership for: major and minor (seed funding) initiative research projects, proposal preparation support for larger proposals, data collection, proof-of-concept studies, equipment purchase, member travel, external speaker expenses and required cost share. In FY17, MTTI provided almost $130,000 in direct membership support, as depicted in Figure 4. In addition to direct support provided in the Figure, MTTI supports its membership through staff support for proposal development and in administrating various tasks and events. These expenses accounted for approximately 1/3 of total MTTI expenses in FY17.

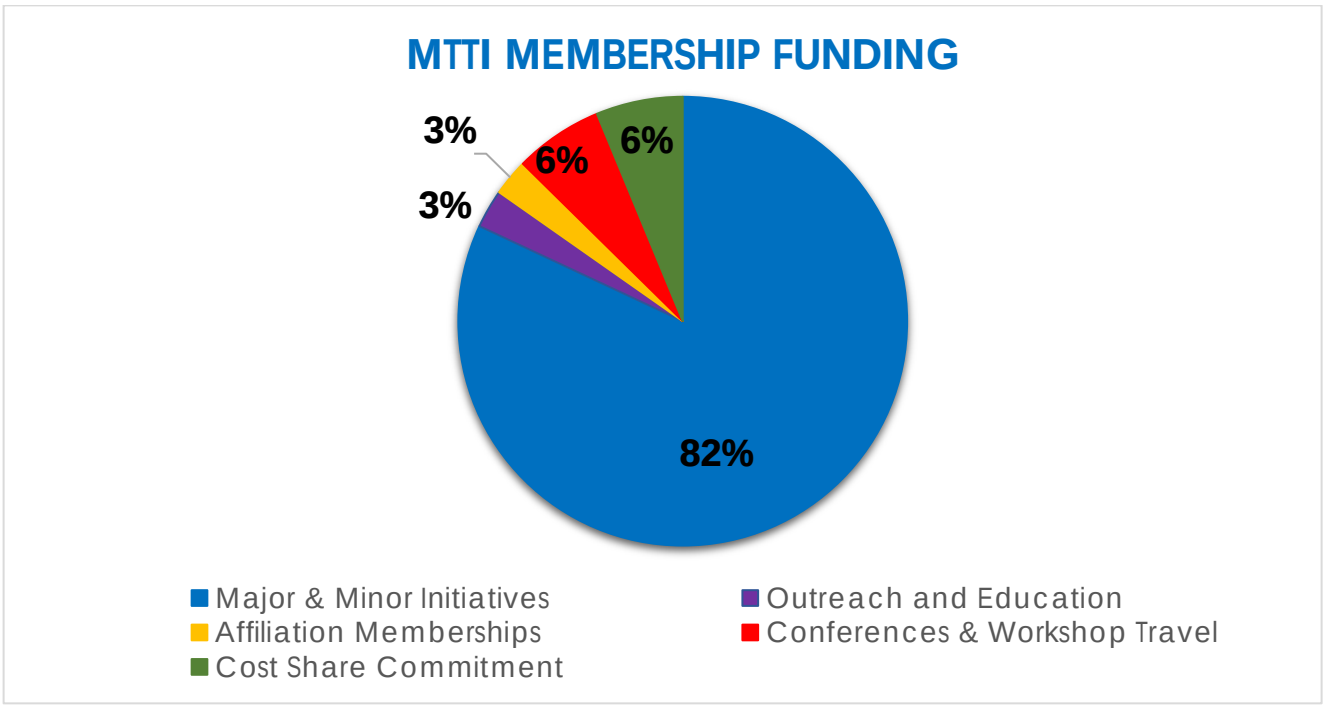


FIGURE 4 MTTI MEMBERSHIP FUNDING

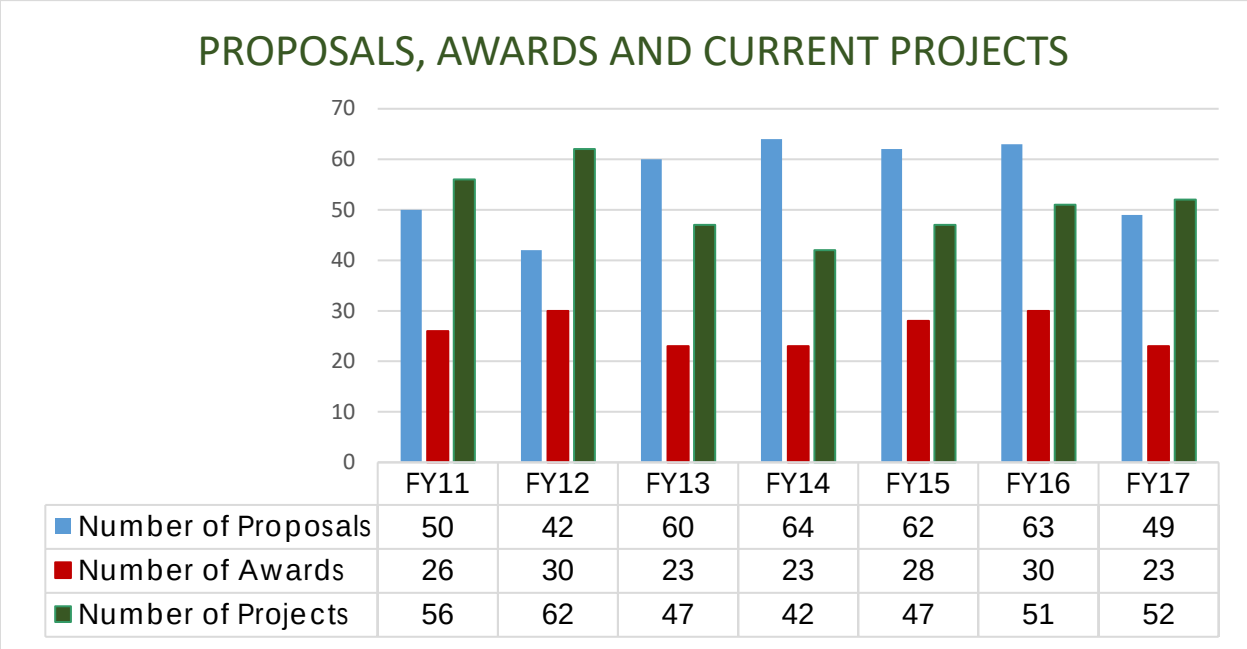
In FY2017, MTTI provided funding for outreach and youth education, cost share for Michigan Department of Environmental Quality proposals, purchased a new display unit for Dillman 315, sponsored the Clean Snowmobile Challenge, provided funding for renovations of the Center for Technology & Training, supplied MTTI members with networking opportunities through fees for transportation affiliated associations, financed the final years of funded major initiatives, subsidized membership travel and funded invited speaker travel costs. The highlight of the year was the organization of 1st Mobility Summit on campus. This will also be discussed later in the report.

Accomplishments

RESEARCH

MTTI researchers collaborated on proposal submissions to funding sponsors totaling **$11,448,511** in 2017. **49** proposals were submitted of which **23** were awarded funding for an approval rate of **47%**. Research awards amounted to **$3,315,179**. MTTI currently has **52** projects in progress.

The following charts provided a five year summary of MTTI research; Figure 5 provides an overview of research projects from proposal submissions to award, annual proposal submissions are depicted in Figure 6 with award funding shown in Figure 7. A list of all proposals submitted through MTTI in FY17 is included in Appendix A.



	FY11	FY12	FY13	FY14	FY15	FY16	FY17
Number of Proposals	50	42	60	64	62	63	49
Number of Awards	26	30	23	23	28	30	23
Number of Projects	56	62	47	42	47	51	52

FIGURE 5 PROPOSALS, AWARDS, AND CURRENT PROJECTS

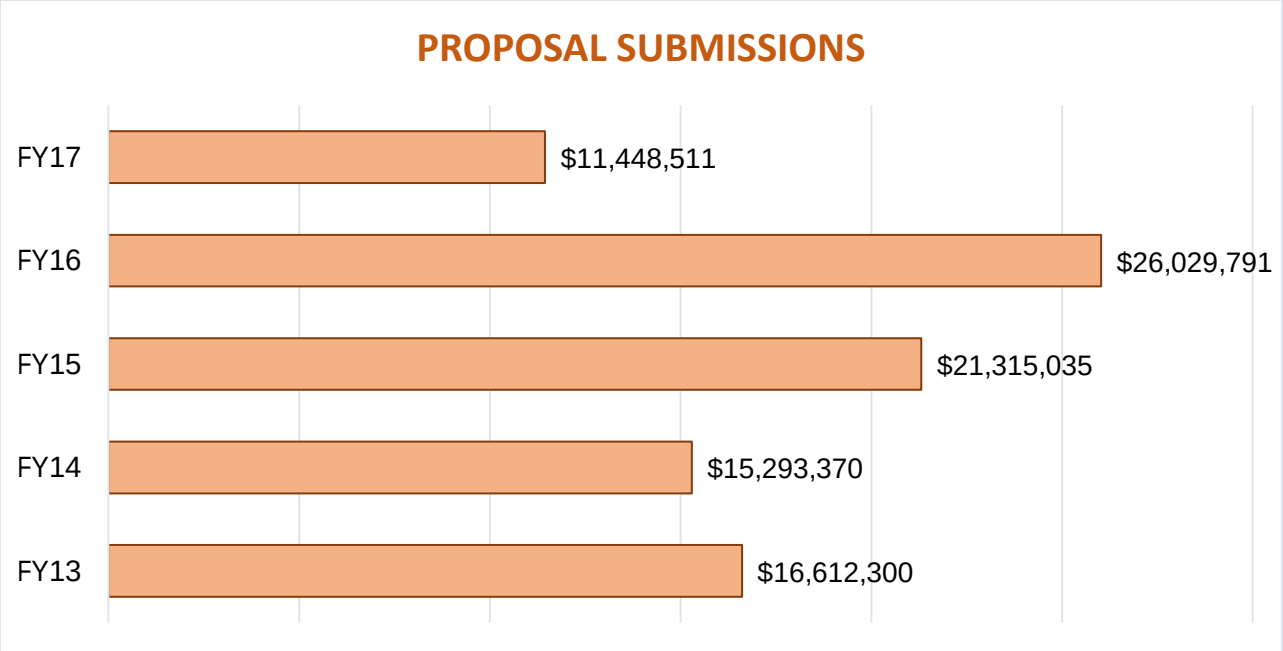


FIGURE 6 PROPOSAL SUBMISSIONS

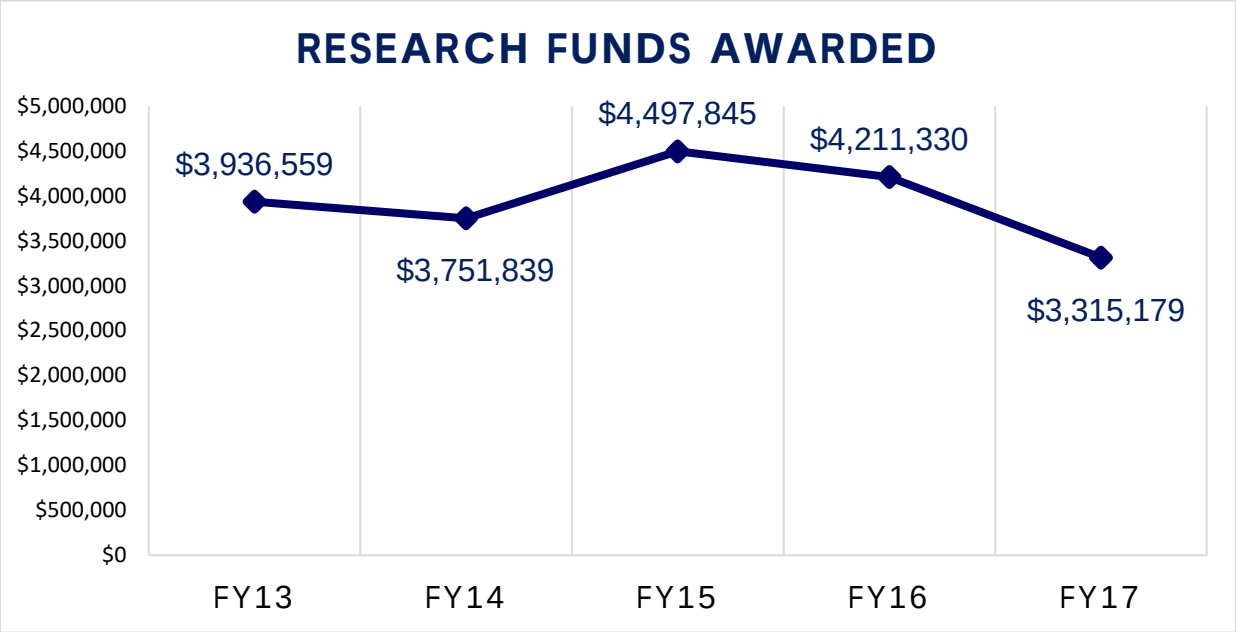


FIGURE 7 RESEARCH FUNDS AWARDED

RECOGNITION

TIM COLLING, Director of the Center for Technology & Training, was honored by the Michigan Transportation Asset Management Council (TAMC) with the Carmine Polumbo Individual Award for Colling's asset management-related service in Michigan.

AARON DEAN, Rail Transportation Program (RTP) undergraduate student and research assistance, was awarded a grant from the Undergraduate Research Internship Program (URIP) for his project "Effectiveness of Using SHRP2 Naturalistic Driving Study (NDS) Data to Study Driver Behavior at Highway-Rail-Grade Crossings".

STEVEN LANDRY, a PhD student in the Applied Cognitive Science and Human Factors program working on the National University Rail Center (NURail) project was selected NURail Student of the Year. The NURail Center designates an "outstanding graduate student" through a program jointly sponsored by the U.S. Department of Transportation and the Council of University Transportation Centers (CUTC). Landry's research interests include in-vehicle information system design, driver safety, and multimodal interaction.

CEE and RTP student DARIAN REED was awarded a Summer Undergraduate Research Fellowship (SURF) to study the "Evaluation of Methods to Record Head Orientation in Driving Simulator and In-Vehicle Study Environments".

OUTREACH

MTTI provides financial support of affiliation fees to multiple external organizations in which members can participate in workshops, respond to RFPs, collaborate with other researchers and showcase their expertise. Fees were financed to THE AMERICAN PUBLIC TRANSIT ASSOCIATION (APTA), COUNCIL FOR UNIVERSITY TRANSPORTATION CENTERS (CUTC), and the NATIONAL ROAD RESEARCH ALLIANCE (NRRA).

JAKE HILLER (CEE) represented MTTI at the NRRA annual meeting and at the 2017 Pavement Conference and Workshop held in St. Paul, MN. Jake is a member of the NRRA Rigid Pavement Team while ZHANPING YOU (CEE) works with the Flexible Pavement Team.

PAM HANNON (MTTI) traveled to the Transportation Research Board annual meeting in Washington, DC attending conferences and workshops as well as representing MTTI at the CUTC annual winter meeting.

EDUCATION

MTTI faculty and staff are committed to providing opportunities for students to explore their role in *creating the transportation of the future* through financial sponsorship of educational youth programs. The past year included funding for:

- **"Design a Sustainable Future" Teacher Institute** – Teachers of grades 4-12 convened on the MTU campus for a workshop providing them with the tools for sharing STEM education with their students including product life cycles, building design, renewable energy sources, low impact site design, water reuse, and smart transportation.

- **KBIC Middle School Exploration** – This 3 week Engineering Exploration camp at MTU answered the question of "What is Engineering" for local middle school students. Explorations included chemical engineering, biomedical engineering, civil engineering and bridge building, transportation engineering, environmental engineering and materials engineering.

- **Natural Resource & Engineering Career Exploration** - Michigan Tech hosted a 6-day trip to explore environmental science and engineering majors for all high school students in Detroit and Wayne Counties. Included in the exploration were forestry, natural resources, wildlife, engineering, and water quality activities.

- **Rail and Intermodal Transportation Summer Youth Program** – A week long exploration for students entering grades 9-12, the program is a collaboration between MTU and the University of Wisconsin-Superior. Hands-on and classroom activities include exploring the effects of rail stability, operating a computer locomotive simulator, and investigating logistics management operations with field experiences in Michigan, Wisconsin, and Minnesota.

INTERCAMPUS SUPPORT

In an effort to increase campus collaboration, MTTI took the lead in multiple events to increase the visibility and to explore new opportunities in transportation on and off campus.

Mobility Related Activities

MTTI led the organization and retrieval of campus data in response to an RFP issued by the U.S. Department of Transportation (USDOT) for a Beyond Traffic Innovation Center (BTIC). Michigan Tech was selected as one of the seventeen Beyond Traffic Innovation Centers (BTIC) in the nation; one of three universities to serve the rural areas of the US. Figure 8 identifies other campus entities involved in the proposal.

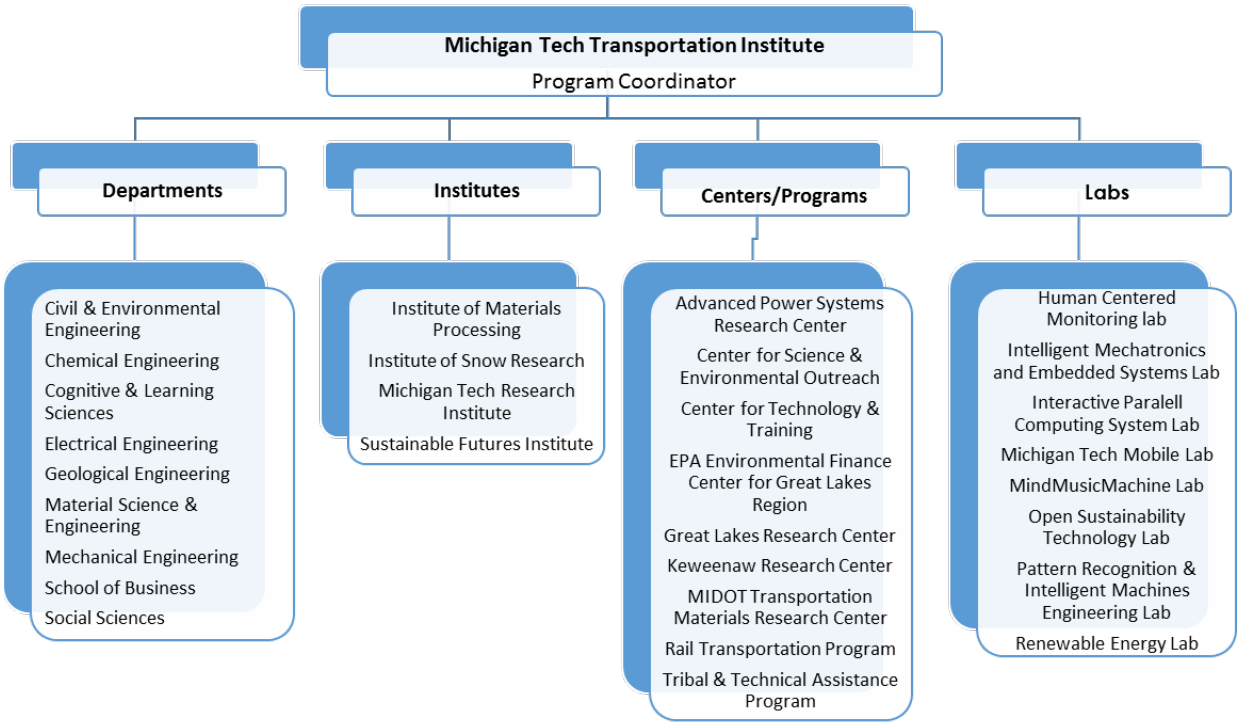


FIGURE 8 CAMPUS COLLABORATERS ON USDOT PROPOSAL

MTTI also collaborated with the KRC in their proposal submission to the USDOT for the Designated Automated Vehicle Proving Grounds Pilot Program. MTTI retrieved and organized campus data for the submission.

Prompted by the information collected for the Proving Grounds proposal and the realization that many on campus were not aware of KRC's facilities, MTTI organized a campus tour of the winter proving grounds for faculty and staff.

Michelle Mueller, Senior Project Manager for MDOT's Connected and Automated Vehicles (CV/AV) program, contacted MTU for a summary of Michigan Tech's educational and workforce development activities in the CV/AV area, in order to provide an update to MDOT Director Kirk Steudle. MTTI gathered information on curriculum, programs, outreach, groups and associations, then provided a two page high level summary along with a 15 page overview of campus activities to Jay Meldrum (KRC), who forwarded on to Mueller.

As mentioned earlier, the most significant event for MTTI was the collaboratively organized Mobility Summit on campus. Encouraged by the mobility related activities outlined above, a group of Michigan Tech stakeholders decided to organize the Summit and MTTI took one of the leading roles. MTTI extended an invitation to Director Steudle for a campus visit to showcase MTU's space in the mobility field and to provide a keynote address in the Summit. Also invited to provide comments was Dr. Paul Rogers, Director of the Tank Automotive Research, Development and Engineering Center (TARDEC). This

event was organized by Michigan Tech's mobility-affiliated research centers and institutes, including MTTI, the Vice President for Research and the College of Engineering.

Figure 9. Mobility Summit Keynote Speakers with President Mroz and Tech Event Leaders

Eighteen faculty and student researchers provided brief Tech Talks type of overviews on their projects. Topics ranged from connected and autonomous vehicles to technology enabling mobility, infrastructure, education, cybersecurity and human factors. Researchers from six university departments or centers took part in the presentations. In addition, a poster session provided more in depth information on projects, facilities and opportunities at Michigan Tech.

As a consequence of the multiple CV/AC activities on campus, a mobility group list serve and website were created for better communication among campus players.

Other Outreach Activities

For the eighth consecutive year, MTTI financially sponsored the annual CLEAN SNOWMOBILE CHALLENGE, organized and led by the KRC.

MTTI also provided in kind support to the UP ROAD BUILDERS ASSOCIATION for their annual auction, which raises funds through the donations for a student scholarship endowment. MTU CEE students were the recipients of $8,000 in scholarship funding plus two $500 cooperative awards in FY17.

Both CTT and MTTI cooperated to host the October 2016 First Friday Social in an effort to expand campus relations and create an environment for networking and socialization with all departments on campus.

The Rail Transportation Program (under MTTI umbrella) organized both on and off-campus professional events. 3rd annual Rail Day/Expo and Railroad Night XII brought a dozen industry companies on campus, allowing students, faculty and local technology companies to be immersed in latest rail technology developments. 4th annual Michigan Rail Conference, on the other hand, brought 160 rail transportation stakeholders to Marquette to discuss latest issues and trends within and outside Michigan.

CONFERENCES AND WORKSHOP TRAVEL

MTTI researchers, staff, and students participate in and lead transportation conferences and workshops at the local, state, national and international level. Much of the travel is covered by the individual through project funds, but a MTTI travel stipend is also available to all members to support their participation in such events, increasing the visibility and recognition of MTTI and Michigan Tech. The following activities were supported by MTTI travel stipends in FY 2017:

- SIYU CHEN, a PhD student in CEE, attended the 2017 Transportation Research Board (TRB) in Washington, DC where he presented a poster and attended sessions and workshops.
- Also attending TRB, QINGLI DAI (CEE) presented two papers and visited the National Science Foundation for meetings with her program manager on her NSF project.
- CEE PhD student ANDREW GROENEVELD presented research on Ultra High Performance Concrete (UPHC) in a technical session at the First International Interactive Symposium in Des Moines, Iowa.
- PASI LAUTALA (CEE) led the AR040 Standing Committee on Freight Rail Transportation meeting at the 2017 annual TRB meeting, plus presented a poster on his current research.
- Traveling to India, THOMAS OOMMEN (GMES) met with landslide experts in South Asia and was an invited presenter at the Indian Geotechnical Conference.
- CEE PhD student MOHAMMADHOSSEIN SADEGHIAMIRSHAHIDI presented a paper entitled "Slope Movement in Permafrost near Fairbanks Alaska" at the 2016 Geo-Chicago conference.
- XU YANG (CEE PhD) traveled to Ann Arbor, MI to participate in the 7th Rubber Modified Asphalt Conference.
- In Beijing, Fuzhou, and Xi'an, China, ZHANPING YOU presented on four topics at the Beijing University of Technology, presented in a workshop at Fuzhou University, and had committee meetings in Xi'an.
- KUILIN ZHANG (CEE) attended the 2017 TRB annual meeting for workshops, sessions and committee meetings.

Institute Membership

FY17 membership in MTTI increased to over 80 members in multi-disciplinary centers, institutes, programs and departments. Current MTTI members are listed below.

CENTERS, INSTITUTES AND PROGRAMS

CENTER FOR SCIENCE AND ENVIRONMENTAL OUTREACH (CSEO)
Joan Chadde, Director

CENTER FOR TECHNOLOGY AND TRAINING (CTT)
Chris Codere, Senior Project Manager
Tim Colling, Director
Chris Gilbertson, Associate Director
John Kiefer, Research Engineer II
Nick Koszykowski, Principal Programmer
Dale Lighthizer, Training Development Specialist
Luke Peterson, Principal Programmer
Gary Schlaff, Senior Project Manager
Peter Torola, Research Engineer II

GREAT LAKES RESEARCH CENTER (GLRC)
Guy Meadows, Director

KEWEENAW RESEARCH CENTER (KRC)
Russ Alger, Director, Snow Institute
Jay Meldrum, Director

MICHIGAN TECH RESEARCH INSTITUTE (MTRI)
Don Atwood, Senior Research Scientist
Michael Battaglia, Assistant Research Scientist
Colin Brooks, Senior Research Scientist
Laura Bourgeau Chavez, Research Scientist
Rick Dobson, Assistant Research Scientist
Sarah Endres, Assistant Research Scientist
Liza Jenkins, Research Scientist II
Chris Roussi, Senior Research Scientist/Engineer
Reid Sawtell, Research Scientist I

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

SUSTAINABLE FUTURES INSTITUTE (SFI)
Robert Handler, Operations Manager

TRIBAL TECHNICAL ASSISTANCE PROGRAM (TTAP)
John Velat, Director
Scott Bershing, Technical Editor

DEPARTMENTS AND SCHOOLS

BIOLOGICAL SCIENCES (BS)
Nancy Auer, Professor
Rupali Datta, Associate Professor

CHEMISTRY (CHEM)
Shiyue Feng, Professor
Pat Heiden, Professor

CIVIL AND ENVIRONMENTAL ENGINEERING (CEE)
Tess Ahlborn, Professor
Brian Barkdoll, Professor
Jennifer Becker, Associate Professor
Bill Bulleit, Professor
Qingli Dai, Assistant Professor
George Dewey, Associate Professor
Dave Hand, Department Chair
Jake Hiller, Associate Professor
Ralph Hodek, Associate Professor
Zhen Liu, Assistant Professor
Kris Mattila, Associate 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

COGNITIVE AND LEARNING SCIENCES (CLS)
Kedmon Hungwe, Associate Professor
Myounghoon Jeon, Assistant Professor
Kelly Steelman, Assistant Professor

COMPUTER RESOURCES
Gowtham Shankara, Director

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)
Snehamoy Chatterjee, Assistant Professor
John Gierke, Department Chair
Thomas Oommen, Associate Professor
Rudiger Escobar Wolf, Post Doctorate

HUMANITIES (HU)
Ann Brady, Professor
Karla Kitalong, Professor
Erin Smith, Principal Lecturer

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
Min Wang, Assistant Professor

MECHANICAL ENGINEERING-ENGINEERING MECHANICS (ME-EM)
Andrew Barnard, Assistant Professor
Joshua Pearce, Associate Professor
Ye Sun, Assistant Professor

PHYSICS (PHYS)
Claudio Mazzoleni, Associate Professor

SCHOOL OF BUSINESS AND ECONOMIC (SBES)
Jon Leinonen, Mentor in Residence
Paul Nelson, Associate Professor

SCHOOL OF FOREST RESOURCES & ENVIRONMENTAL SCIENCES (SFRES)
Evan Kane, Assistant Professor

SOCIAL SCIENCES (SS)
Melissa Baird, Assistant Professor
Don Lafreniere, Assistant Professor
Carol MacLennan, Professor
Tim Scarlett, Associate Professor
Chelsea Schelly, Assistant Professor
Richelle Winkler, Assistant Professor
LouAnn Wurst, Professor

VAN PELT & OPIE LIBRARY (LIB)
Sarah Lucchesi, Instructional & Learning Librarian

Patricia Helsel, Associate Professor

VISUAL AND PERFORMING ARTS (VPA)

Space and Facilities Requirements

MTTI doesn't currently hold official ownership of facilities, but rather uses facilities that are officially designated for Departments, etc. It is believed that current space and facilities available to MTTI staff and researchers are sufficient at this time. However, due to significant investments that MTTI has made in various space improvements in the past, the "ownership" of these spaces will be discussed in more detail during FY 18. This is to secure that MTTI investments are protected in the long term.

Future Plans and Goals

The goals set by the Director and Executive Committee for the remaining portion of FY17 and communicated to the general membership at the semi-annual meeting in January 2017, are provided below. After each goal is the status at the end of FY 17:

1. "Simplify" Operations
   - Finalize/approve updated Charter/Bylaws - IN PROGRESS
   - Develop (and maintain) timely election schedule/structure - COMPLETED
   - Finalize EC policy and procedure document – IN PROGRESS
   - Updated cost share policy (for projects requiring cost share) - COMPLETED

2. Increase MTTI visibility
   - Improve web site – IN PROGRESS
   - Organize events (KRC test tack tour/MTTI speakers, etc.) - CONTINUOUS
   - Discuss future opportunities with MDOT

3. Enhance member engagement
   - Increase transparency - CONTINUOUS
   - Survey MTTI membership (results and potential actions) - COMPLETED
   - General meetings each semester - CONTINUOUS
   - Cross-pollination with other transportation entities at Tech - CONTINUOUS
   - Leadership in collaborative PROPOSALS - CONTINUOUS

The goals above are also valid for the FY18. The progress is being monitored by the Director and the Executive Committee and additional goals are expected to be established at the end of 2017 calendar year, as some of the current items get completed.

The Director and Executive Committee also plan to realign MTTI spending priorities due to the reduction in center/institute IRAD return, recently introduced administrative fee on account balances, and potential loss of returns from CTT, if it becomes separated from MTTI umbrella.

Appendix A: MTTI Proposal Submissions FY2017

Principal Investigator	Co-Principal Investigators	Sponsor	Proposal Title	Project Value	Status
Tim Colling	Chris Codere John Kiefer	Michigan Department of Transportation	2017 MI Local Technical Assistance Program	$513,845	Awarded
Zhen Liu		National Science Foundation	CAREER: Understanding of Stresses in Porous Materials based on Atom-level Forces	$569,934	Declined
Kuilin Zhang		National Science Foundation	CAREER: Data-driven optimization and control of connected vehicles for resilient and independent smart grid and intelligent transportation systems	$568,745	Declined
Pasi Lautala	Myounghoon Jeon Dave Nelson	Federal Railroad Administration	Driver Behavior at Highway-Rail Grade Crossings Using NDS Data and Driving Simulators	$271,223	Awarded
John Velat		Federal Highway Administration	TTAP	$140,000	Additional Funding
Kuilin Zhang		University of Michigan Dearborn	Connected and Automated Accessible Transportation	$60,000	Pending
Kuilin Zhang		RSG, Inc.	MDOT Statewide Passenger and Freight Travel Demand	$2,000	Awarded
Tim Colling	Gary Schlaff	Michigan Department of Transportation	MIRE Upgrades in Road Soft	$88,257	Awarded
Tim Colling	John Kiefer	Michigan Department of Transportation	TAMC Activities 2017	$69,606	Awarded
Zhanping You	Chris Gilbertson	Michigan Department of Transportation	Identify Best Practices in Pavement Design, Construction and Maintenance in Wet Freeze Climates Similar to Michigan	$183,489	Awarded
Tim Colling	John Kiefer Chris Gilbertson	Michigan Department of Transportation	2017 TAMC Education Work Program	$208,659	Awarded
Zhanping You	X. Yang, S. Chen	Michigan Department of Transportation	Pavement Thickness Evaluation Using 3D GPR	$162,858	Awarded
Zhanping You	X. Yang	Minnesota Department of Transportation	Is Seal Coating Counterproductive or Not?	$136,508	Pending
Qingli Dai	Xu Yang	Minnesota Department of Transportation	High Density Hot Mix Asphalt (HMA)	$188,292	Pending

Snehamoy Chatterjee		Minnesota Department of Transportation	Truck Station Location Optimization Using Genetic Algorithm Based Metaheuristic Algorithm	$149,662	Pending
Qingli Dai	Bruce Lee	National Science Foundation	Biomimic Design of MicroHydrojets for Reduced Alkali Silica Reaction	$331,427	Declined
Thomas Oommen		National Science Foundation	Landslide Prediction and Measurement Using Satellite Remote Sensing to Advance Hazard Mitigation for Civil Infrastructure	$391,179	Declined
Tim Colling	John Velat	University of North Carolina	Environmental Finance Center Network Small Water Systems Project	$22,001	Pending
Tim Colling	Gary Schlaff Nick Koszykowski	Michigan Department of Transportation	Continuing RoadSoft Support and Development for MDOT Safety Services Unit	$42,959	Pending
Tim Colling	Gary Schlaff Nick Koszykowski	Michigan Department of Transportation	MIRE Upgrades in Road Soft	$88,257	Awarded
Tim Colling	Gary Schlaff Nick Koszykowski Luke Peterson	Michigan Department of Transportation	2017 RoadSoft Asset Management System Development and Support	$775,413	Awarded
Kuilin Zhang		George Washington University	An Integrated Behavior Based Simulation Platform to Model Freeway Traffic in a Connected Driving Environment	$375,001	Pending
Tim Colling	Nick Koszykowski	Michigan Department of Transportation	2017 MERL Development & Support	$90,504	Awarded
Zhen Liu	Pengfei Xue Stan Vitton Jay Meldrum	National Science Foundation	Understanding Thermal Transport Mechanisms in Subterranean Waters for Turning Abandoned Mines into Geothermal Reservoirs	$396,683	Declined
Hyungchul Yoon		University of New Mexico	Objective Monitoring of Transit Operations Safety Using UAVs	$25,000	Pending
Zhanping You		University of Iowa	Rapid Tests and Specifications for Construction of Asphalt-	$50,000	Pending
Tim Colling	Gary Schlaff Nick Koszykowski	Michigan Department of Transportation	Implementation of RoadSoft for MDOT Safety Services	$34,789	Additional Funding
Qingli Dai	Zhanping You	Michigan Department of Environmental Quality	New Plastic Concrete with Pulverized Polyester/Nylon Fibers and Rubber Particles for Structure Construction	$324,000	Pending
Qingli Dai	Jianping Dong	Michigan Department of Transportation	Commercial Production of Non-Proprietary Ultra High Performance Concrete	$150,001	Declined

Zhen Liu	Min Wang Stan Vitton Michael Billmire	Michigan Department of Transportation	Develop and Implement a Freeze Thaw Model Based Seasonal Load Restriction Decision-Support Tool	$151,376	Awarded
Snehamoy Chatterjee	Thomas Oommen	Michigan Department of Transportation	Develop and Implement a Freeze Thaw Model Based Seasonal Load Restriction Decision-Support Tool	$154,866	Declined
Hui Yao	Zhanping You	Michigan Department of Environmental Quality	Tire Rubber Modified Asphalt Emulsion for Effective Pavement Preservation		Pending
Zhanping You		Michigan Department of Environmental Quality	Foamed GTR Asphalt for High Traffic Volume and the Recyclability of GTR Asphalt		Declined
Hyungchul Yoon		National Science Foundation	CR: Exploring Aftershock-induced Structural Damages and their Cascading Effect to Disaster Response	$210,000	Declined
Zhen Liu		National Science Foundation	Understanding Stress Formulation in Multiphase Porous Materials with Hybrid Statistical Mechanics Simulations	$167,249	Pending
Qingli Dai	Bruce Lee	National Science Foundation	pH Sensitive Hydrogels for Pore Chemistry Regulation & ASR Damage Mitigation in Concrete	$330,660	Declined
Thomas Oommen	Snehamoy Chatterjee	Wisconsin Department of Transportation	Monitoring Lateral Earth Pressure and Movements of Cut Retaining Wall	$150,000	Pending
Kuilin Zhang		National Science Foundation	CRISP Type 2: Collaborative Research: A Cyber-Enabled Coordinated Disruption-Response Framework for Enhancing the Resilience of Interdependent Infrastructure Systems	$400,000	Declined
Hyungchul Yoon		National Science Foundation	CPS: Collaborative Research: Monitoring Aftershock-Induced Structural Damages and their Cascading Effect to Disaster Response using Cyber-Physical Systems	$274,400	Pending
John Velat		Federal Highway Administration	Proposal to Establish the Eastern Regional TTAP Center at MTU	$75,000	Additional Funding
Zhanping You	M. Wang, P. Heiden, Q. Dai	Michigan Department of Environmental Quality	Ground Tire Rubber Asphalt for High Traffic Volume Roads	$989,730	Pending

Hui Yao	Zhanping You Qingli Dai	Michigan Department of Environmental Quality	Tire Rubber Modified Asphalt Emulsion for Effective Pavement Preservation	$997,004	Pending
Zhen Liu	Shiyan Hu	National Science Foundation	Image-Data-Driven Deep Learning in Geosystems: Exploratory Investigation into the Stability of Retaining Walls	$277,367	Pending
Tim Colling	John Velat Jon Leinonen Eric Seagren Jennifer Becker Tom Merz Dave Hand Ralph Hodek Paul Nelson Robert Handler	Environmental Protection Agency	EPA Environmental Finance Center for Great Lakes Region	$100,000	Additional Funding
Bob Shuchman	Thomas Oommen	World Bank Group	Building Resilience to Landslide and Geo-hazard Risk in Afghanistan Phase II	$99,998	Pending
Hyungchul Yoon		University of New Mexico	Monitoring of Transit Operations Using Crowdsourcing with Smartphones	$29,630	Pending
Qingli Dai	Dave Hand Min Wang	Michigan Department of Transportation	Research on Reduction of pH Levels from Roadway Underdrain Outlets	$243,039	Pending
Qingli Dai	Zhanping You Min Wang	Michigan Department of Transportation	Effects of Concrete Cure Time on Epoxy Overlay & Sealant Performance	$196,106	Pending
Amlan Mukherjee	Andrew Swartz Colin Brooks Tess Ahlborn	Michigan Department of Transportation	Research on 3D Bridge Models	$191,794	Pending

Appendix B: MTTI Membership Survey Results

A goal of the Director and Executive Committee has been to enhance member engagement in MTTI. To better understand how members perceive MTTI activities and to capture their wants/needs, a survey was provided to members both online and at the semi-annual general meeting. **25** of 60 members participated in the survey of which the results are listed below.

1. **Current Membership Status:**

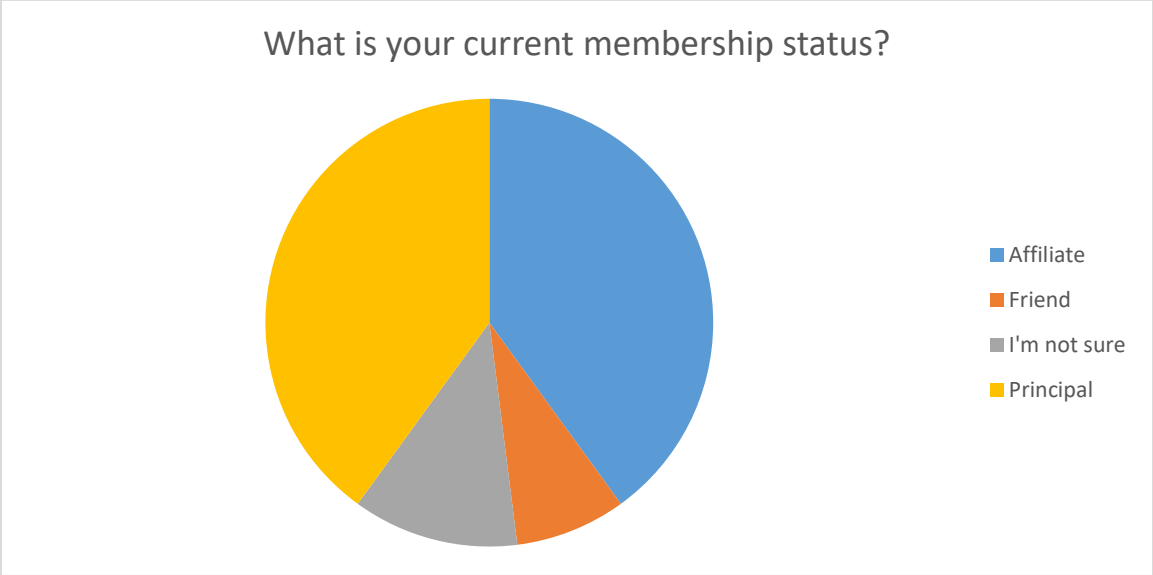


Figure 1: Membership Status

2. **Rank the following 6 areas of MTTU support in order of importance to you with 1 being the least important, 6 being the most important.**

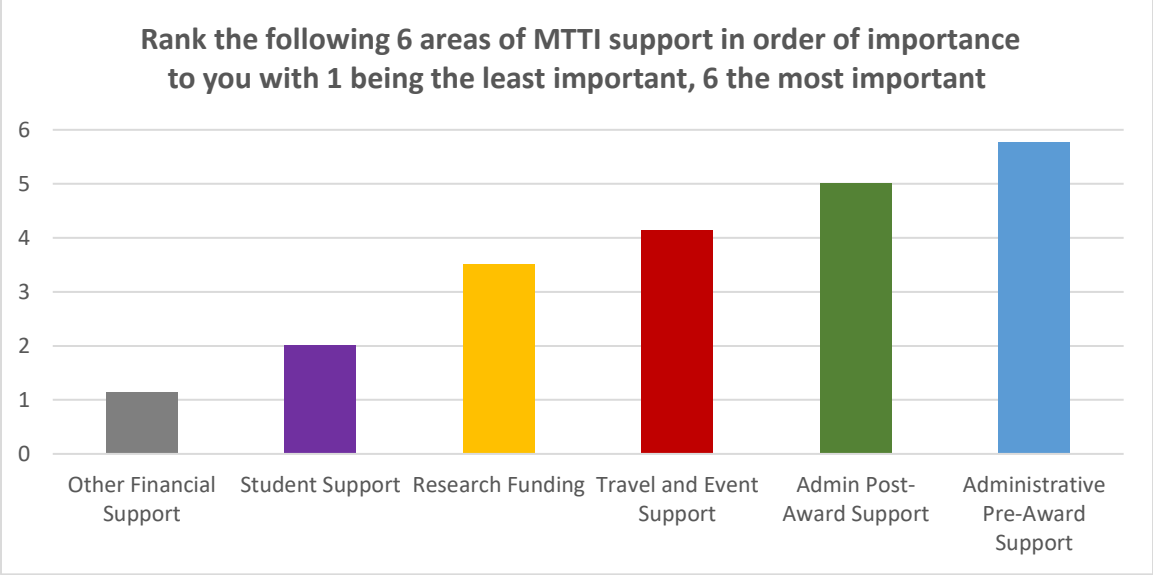


Figure 2: MTTI Support

In order from most to least important:

1. Other Financial Support
2. Student Support
3. Research Funding
4. Travel and Event Support
5. Admin Post-Award Support
6. Administrative Pre-Award Support

3. **From your personal perspective, rate the subcategories of support MTTI can provide in Administrative: Pre-Award Support.**

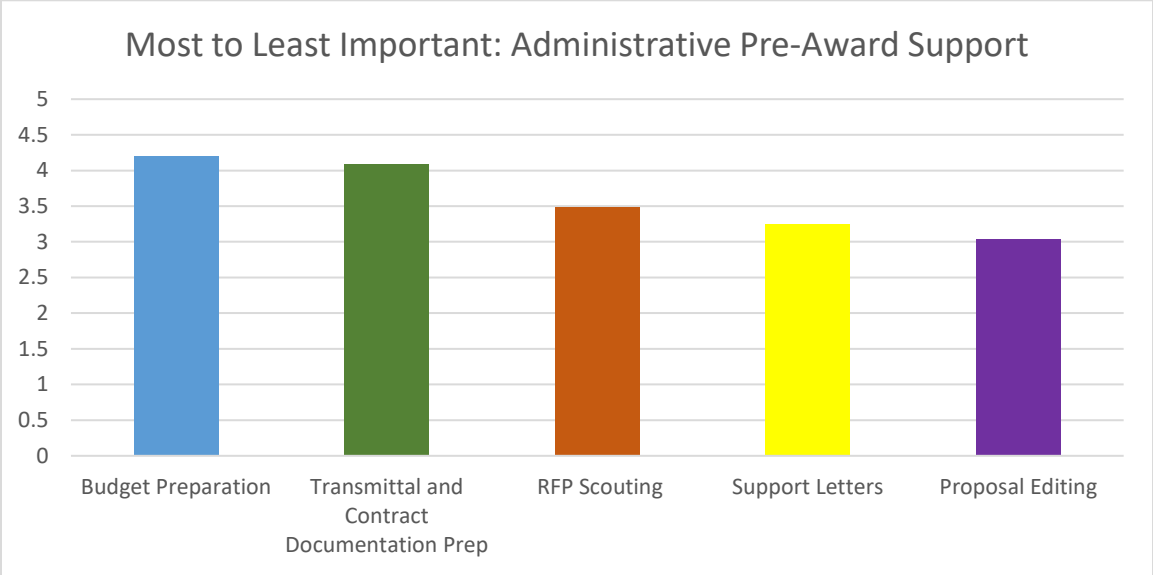


Figure 3: Administrative Pre-Award Support

1. In order from most to least important:
2. Budget preparation
3. Transmittal and Contract Documentation Prep
4. RFP Scouting
5. Support Letters
6. Proposal Editing

4. **From your personal perspective, rate the subcategories of support MTTI can provide in Administrative: Post-Award Support**

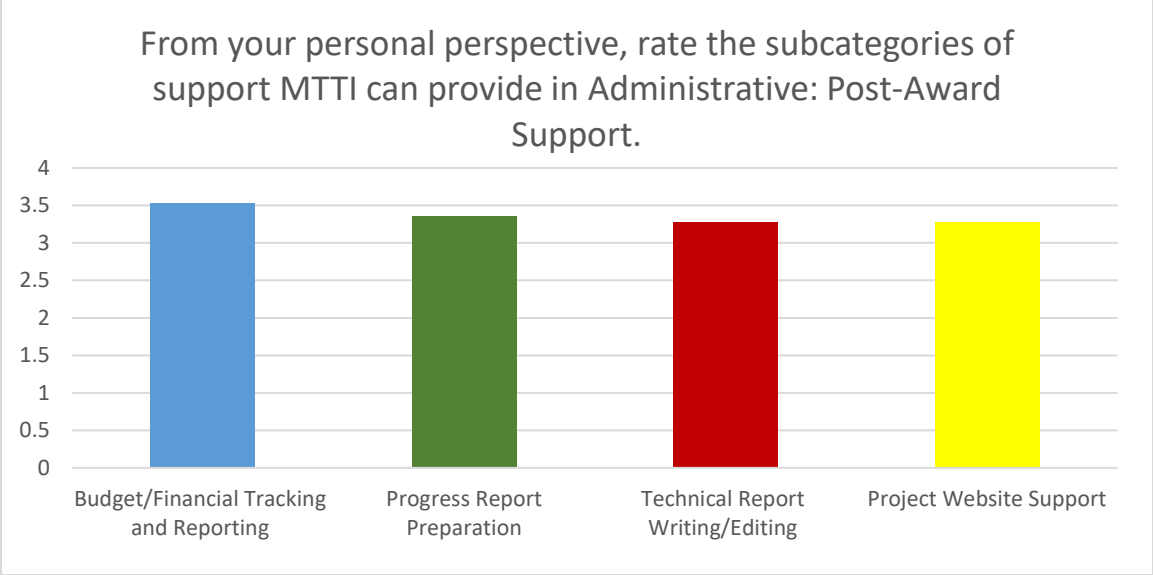


Figure 4: Administrative Post-Award Support

1. In order from most to least important:
2. Budget/financial tracking and reporting
3. Progress report preparation
4. Technical report writing/editing
5. Project website support

5. From your personal perspective, rate the subcategories of support MTTI can provide in Travel & Event Support.

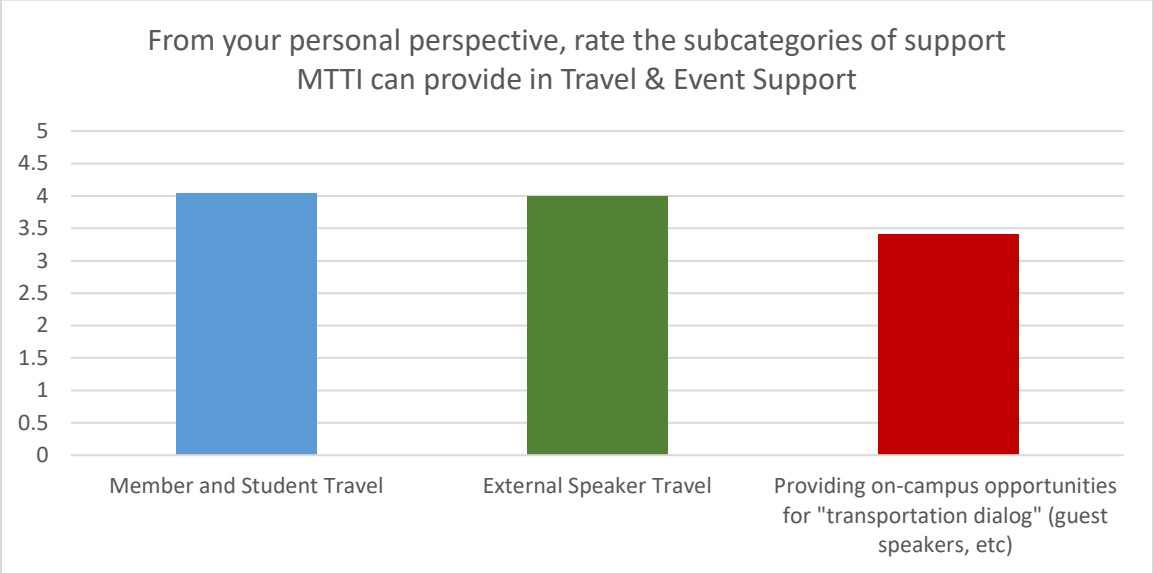


Figure 5: Travel and Event Support

1. Most to Least Important:
2. Member and student travel
3. External speaker travel (For MTTI sponsored speakers)

4. Providing on-campus opportunities for "transportation dialog" (guest speakers, workshops, tech talks, social gatherings)

6. From your personal perspective, rate the subcategories of support MTTI can provide in student support.

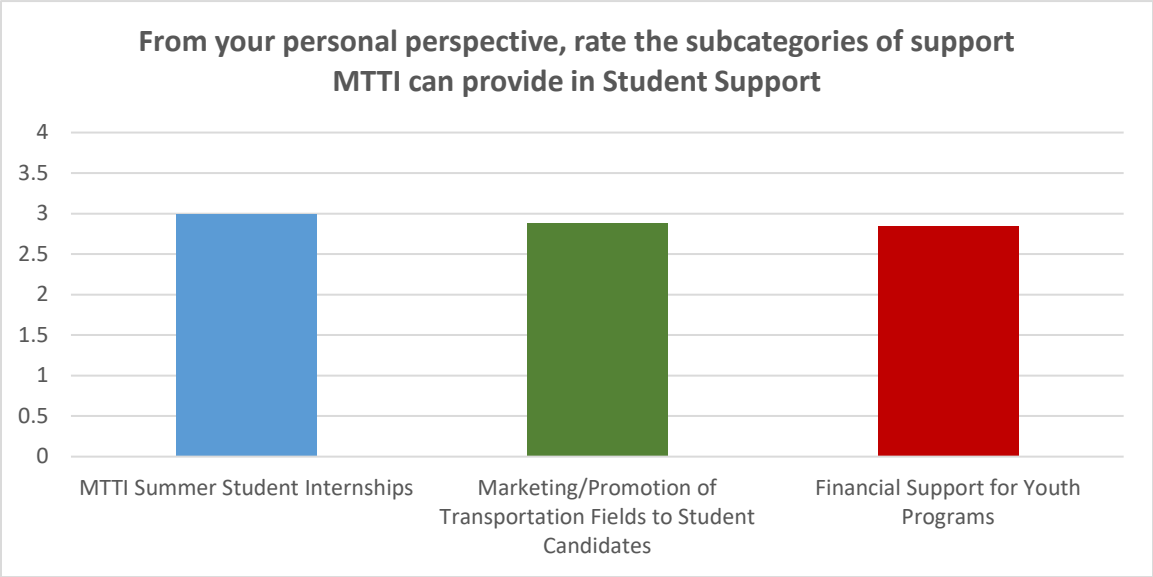


Figure 6: Student Support

Most to Least Important:

1. MTTI Summer Internships
2. Marketing/promotion of transportation field to student candidates
3. Financial support for youth programs

Responses: One person commented that they were not aware MTTI offered student internships**.**

7. From your personal perspective, rate the subcategories of support MTTI can provide in Research Funding.

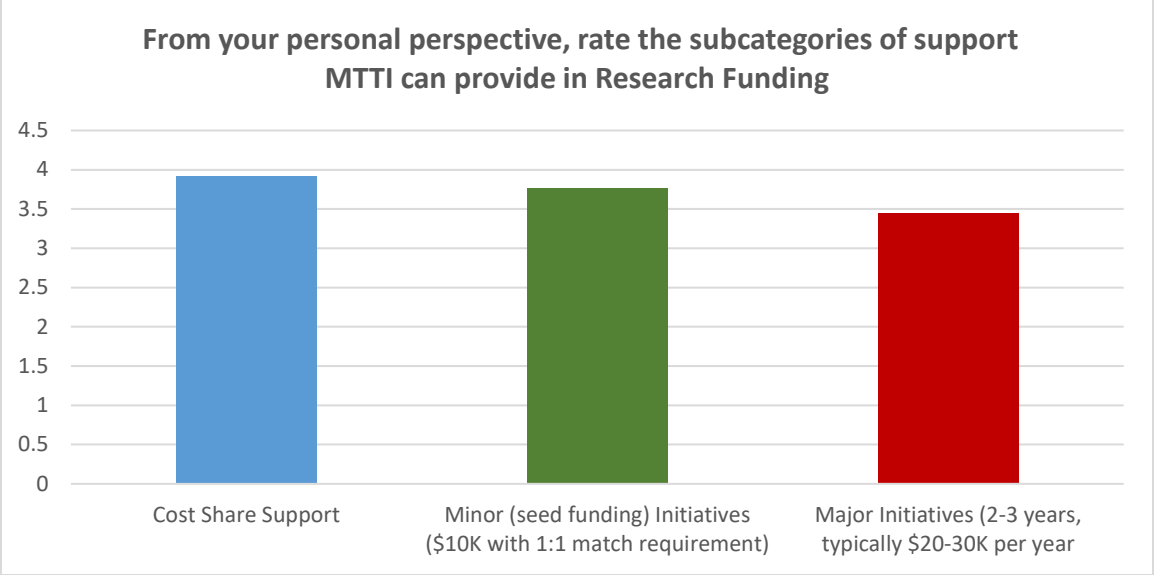


Figure 7: Research Funding

Most to least important:

1. Cost share support
2. Minor (seed funding) initiatives ($10K with 1:1 match requirement)
3. Major initiatives (2-3 years, typically $20-30K per year)

8. From your personal perspective, rate the subcategories of support MTT can provide in Other Financial Support.

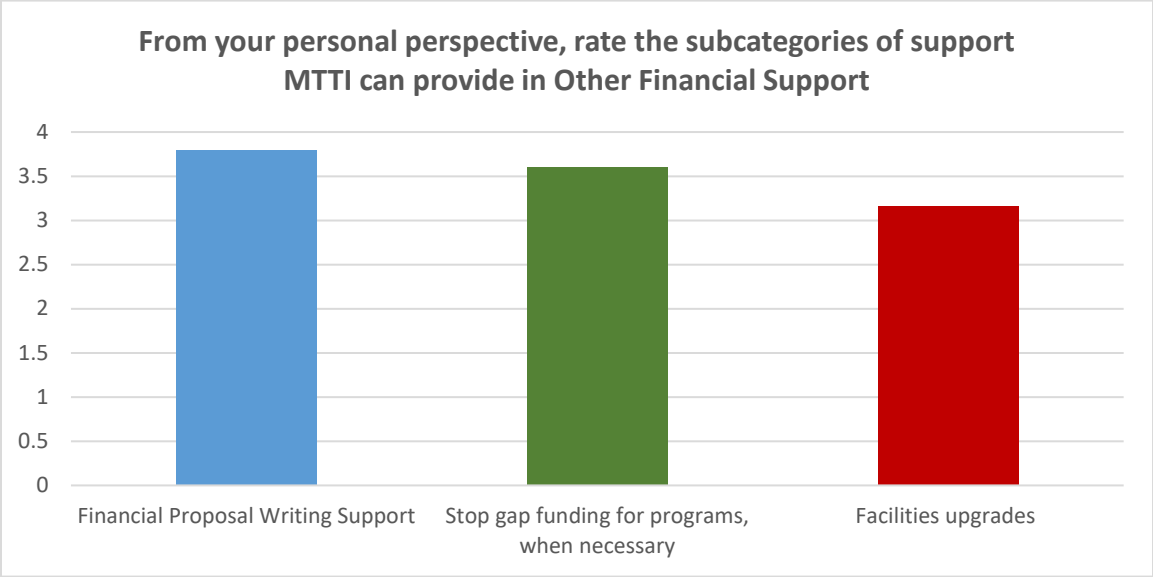


Figure 8: Other Financial Support

Most to Least Important:

1. Financial proposal writing support
2. Stop gap funding for programs when necessary
3. Facilities upgrades

Appendix C: Cost Share Policy

Applicable when sponsor mandated cost share is required.

Level of IDC Return	Any Level
Cost Share Policy	• 0% for the first $1,500 of MTTI IRAD. • Max. 80% of remaining MTTI IRAD Return. • No more than 50% of total project cost share.