

ANNUAL REPORT

2009 – 2010

University Transportation Center

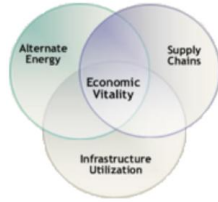
Economic Development – Research – Education – Technology Transfer



The University of Toledo University Transportation Center (UT-UTC) is funded by the U.S. Department of Transportation, RITA which paid for the development and printing of this document

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DIRECTOR'S MESSAGE



This past year was one of radical changes. The phrase "The New Normal" echoed in every conversation. In order to sustain ourselves we have had to embrace agility. Those that do will position themselves for success. Our UTC theme "Transportation for Economic Security and Development: Alternate Energy, Infrastructure Utilization, and Supply Chains" has aligned UT perfectly with the overarching global agility strategies being employed.

Our UTC has also embraced and mirrored the strategic planning philosophy at the University of Toledo. The title of the planning document, *The Relevant University: MAKING COMMUNITY and ECONOMIC ENGAGEMENT MATTER*, perfectly sums up our mission. In a letter to the University community, UT President Lloyd Jacobs stated:

Let me begin by repeating the formal vision statement of The University of Toledo, which states that this university is and should be, "a transformative force for the world." I believe the author of that phrase had in mind a world where universities are more connected to their communities, locally and globally, a world in which universities are more connected to corporate America and to government, and a world where universities not only equip students for the future, but actually create a future for them.

Our Transportation Center has become a primary resource for transformative change in our regional community. We are playing a key role in two intermodal projects in the region. We are installing and researching the first solar installation for the Ohio Department of Transportation. The UT Solar Car Team, which is supported by the UTC, is enabling students to gain firsthand knowledge on how solar energy can be used in transportation. They are designing and building their first car from the ground up. Globally our UTC project in the College of Business to build a network of scholars and educators in global supply chain management and transportation has resulted in conferences here in Toledo, and in Korea, India and Spain.

In a recent editorial in the *Toledo Blade* titled "Collegial University," it was written:

At UT and in the broader community, Dr. Jacobs has shown he knows how to get things done. Under his leadership, UT has become a vital economic engine for northwest Ohio — a leader in the region's burgeoning health-care, alternative-energy, and intermodal-transportation industries.

Finally, the Ohio Board of Regents and its Chancellor have implemented a Centers of Excellence initiative. An Ohio Center of Excellence designation is awarded to nationally recognized academic programs that generate world-class research and help draw talent and investment to the state. I am very honored that The University of Toledo and its University Transportation Center have been designated as a Center of Excellence in Transportation and Logistics.

Without a doubt, success is a team game. I want to thank all those in the public and private sectors who have backed our efforts. Without their hard work much of what was accomplished would never have happened. I especially want to thank the UT executive leadership, the UT Board of Trustees, and especially our President, Dr. Lloyd Jacobs, for their staunch conviction in support of our enterprise.



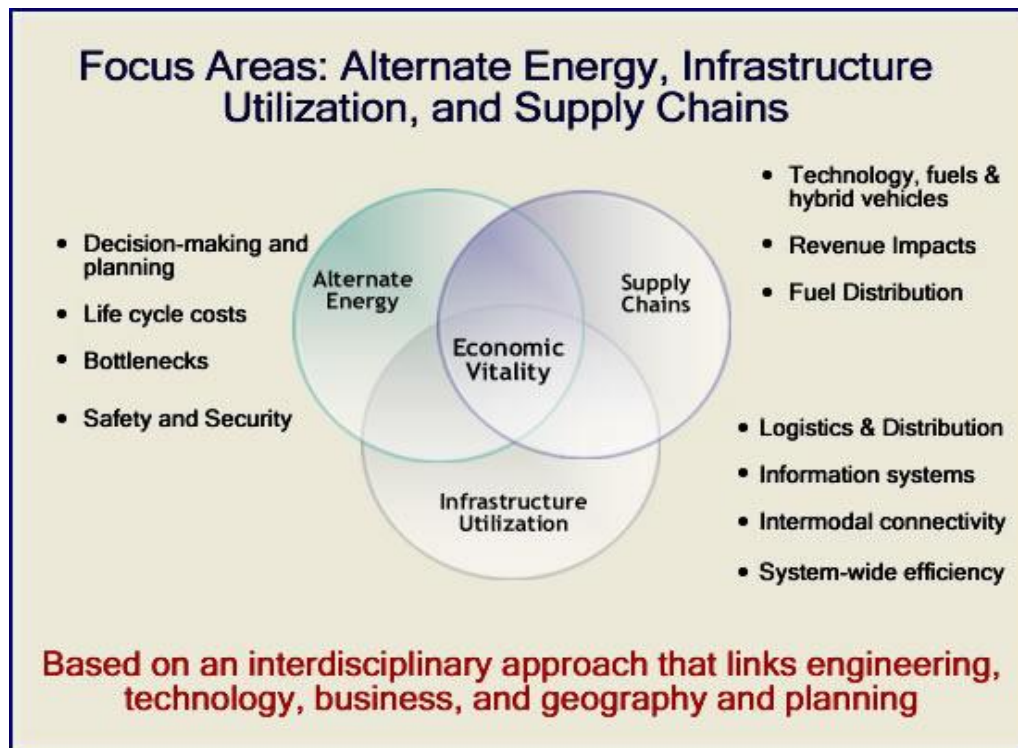
Richard S. Martinko, P.E.
Director
University Transportation Center &
Intermodal Transportation Institute



CENTER THEME

The theme of The University of Toledo University Transportation Center is *Transportation for Economic Security and Development: Alternate Energy, Infrastructure Utilization, and Supply Chains*. Safe, secure, and efficient transportation systems are essential to the economic viability, quality of life, and strength of our nation. If the U.S. economy is to reach new heights, the transportation system must be capable of moving people and goods safely, quickly, and efficiently. This Center focuses on three critical elements in the transportation system: alternate energy for transportation, infrastructure utilization, and supply chain management.

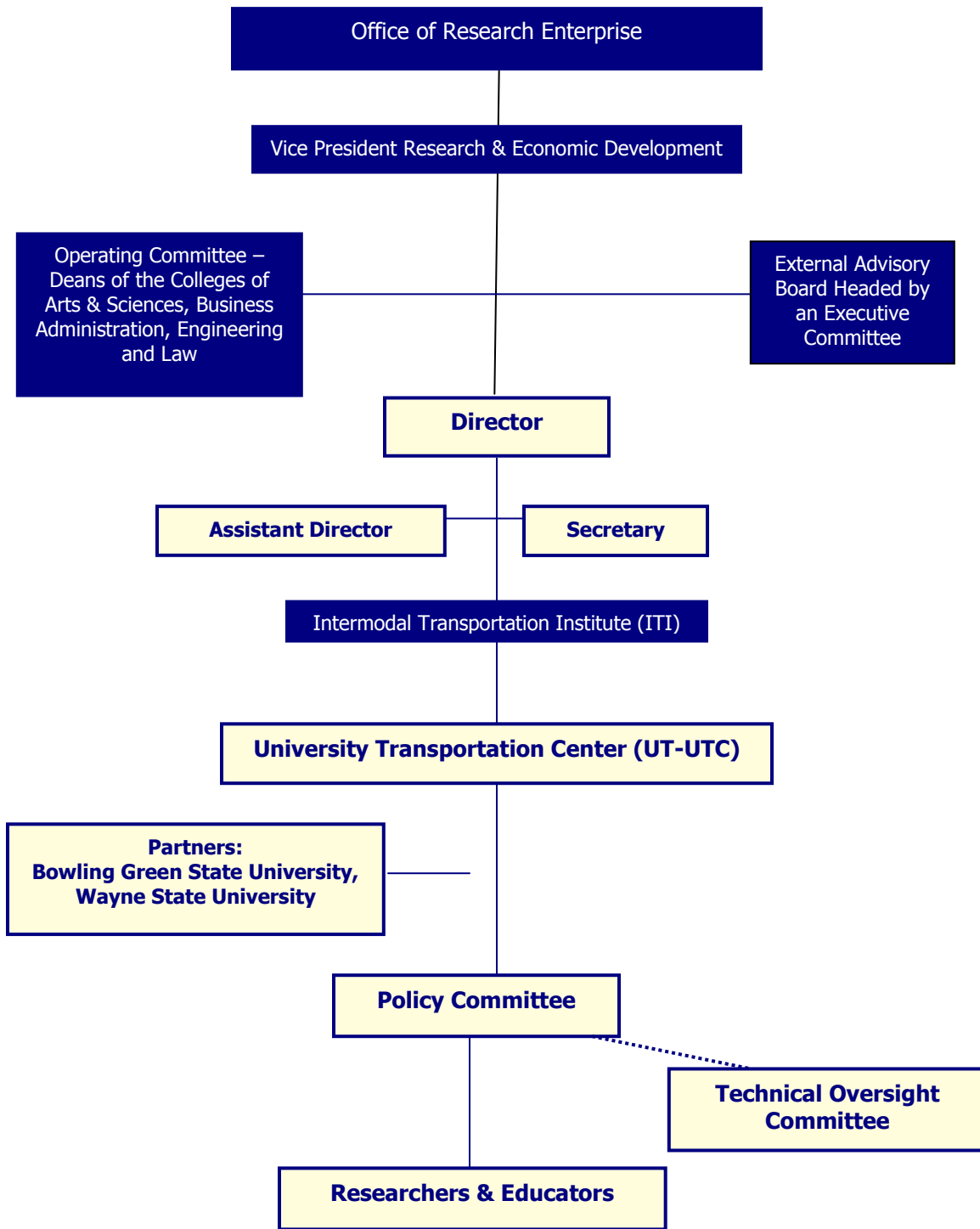
Figure 1: Overview of University of Toledo UT-UTC



The vision of the UT-UTC is to develop technology-enabled intermodal transportation systems and supply chains that promote economic development and quality of life. It will provide research, education and training, and planning and technical assistance in developing and maintaining technology enabled, efficient, secure, and environmentally sound transportation systems, supply chains, and logistic processes. It will emphasize technology transfer to stimulate economic growth and vitality. The UTC will facilitate the application and integration of public and private sector ideas, foster cooperation among the academic partners, and educate current and future leads who have diverse backgrounds and innovative perspectives. This UTC will work with other organizations and institutions to create, pool, and disseminate knowledge that is critical to the long-term success of the U.S. economy. The UTC will provide benefits to state DOTs, departments of development, and transportation planning agencies. To ensure this, stakeholders will be involved in advisory groups, which will help to focus efforts and achieve success as defined by customers and not by researchers. This vision is based on the notion that excellence in research, education, and technology transfer depends on problem statements that are designed with broad stakeholder participation.

MANAGEMENT STRUCTURE AND PRINCIPAL CENTER STAFF

Organization Chart



Institutional Resources

The UT-UTC is a consortium that is led by The University of Toledo with its partners, Bowling Green State University in Bowling Green, Ohio and Wayne State University in Detroit, Michigan. The consortium allows for a pooling of institutional resources that allow for a concentrated effort in addressing the critical problems facing our transportation system in the areas of alternate energy, infrastructure utilization, and supply chains. In this way, more can be accomplished in the areas of research, education, and technology transfer than working independently. These universities possess strong faculty and research facilities, have diverse interdisciplinary educational programs, and ample numbers of graduate students to make a positive difference in the transportation area.

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MEMBER UNIVERSITIES

The University of Toledo – Lead University

The University of Toledo (UT) is a Carnegie Doctoral/Research-Extensive, state-supported university with an enrollment of approximately 20,700 undergraduate, graduate and professional students and more than 1,300 full time and part-time faculty members. The University of Toledo, a student-centered public metropolitan research university, integrates learning, discovery and engagement, enabling students to achieve their highest potential in an environment that embraces and celebrates human diversity, respect for individuals and freedom of expression. The University strives for excellence in its service to all constituents, and commits itself to the intellectual, cultural and economic development of our community, state, nation and the world.



UT offers more than 250 undergraduate, graduate and professional programs in the colleges of Arts & Science, Business Administration, Education, Engineering, Health and Human Services, Law, Medicine, Nursing, Pharmacy, and University College. On July 1, 2006, UT merged with the Medical University of Ohio, to form the third-largest public university operating budget in the state.

For more about UT: <http://www.utoledo.edu/>

Bowling Green State University - Partner

Bowling Green State University (BGSU) has a total enrollment of 20,300 students which includes 17,300 undergraduates. In 2005, BGSU achieved record overall enrollment as well as a record number of students with ACT scores of at least 30. With more than 200 undergraduate majors and programs, BGSU has been recognized by *U.S. News & World Report* for its first year programs and residential living/learning communities. Integral to campus life are the core values: respect, cooperation, intellectual and spiritual growth, creative imaginings, and pride in a job well done. For more about BGSU: <http://www.bgsu.edu/>



Wayne State University - Partner

Wayne State University (WSU) is an urban university located in the heart of the City of Detroit, Michigan. The mission of the University, supported by the taxpayers of Michigan, is to "discover, examine, transmit and apply knowledge that contributes to the positive development and well-being of individuals, organizations and society." Through its research, teaching, and services, it endeavors to engage in a wide range of activities with the local communities. WSU's current enrollment of approximately 30,000 students includes more than 12,000 graduate students. For more about WSU: <http://wayne.edu/>



EDUCATION, RESEARCH AND TECHNOLOGY TRANSFER ACTIVITIES FY 2010

THE YEAR IN REVIEW

- Two research projects housed in the UT-UTC were funded by the Ohio Department of Transportation totaling \$339,142 in SPR monies with total project budgets of \$660,788 including match. This is the first funding by ODOT of UT-UTC related projects. The projects include:
 - Veteran's Glass City Skyway Solar Array Field Demonstration
 - Ice Prevention or Removal on the Veteran's Glass City Skyway Cables
- Total budgets for UT-UTC research projects, including economic development related projects, reached \$1,851,253 with \$584,006 in new projects funded in fiscal year 2010. All research projects, including ODOT funded projects, equaled \$2,512,041.
- Fourteen final reports on UT-UTC funded research projects have been posted and disseminated; two more are in review.
- UT-UTC support for education projects reached \$83,917, excluding match.
- Relationships with primary/secondary schools ramped up with two projects completed by the Alternate Energy Team at the Toledo Technology Academy and continued support of valuable field trips at the Maritime Academy of Toledo.
- The fourth Student-of-the-Year was recognized in Washington at the CUTC banquet in January 2010.
- The University of Toledo researchers continued affiliations and partnerships with the Great Lakes Maritime Research Institute, CFIRE, and the Michigan-Ohio UTC.
- The economic development project to expand the Norfolk Southern intermodal yard at Airline Junction in Toledo received full funding from both public and private sources. The ITI/UTC played an integral role in City Council hearings and public meetings as well as private discussions with business and marketing interests.
- The ITI/UTC was chosen by the University administration to be one of three UT programs nominated for the Ohio Board of Regents Centers of Excellence designation. The presentation was made to Chancellor Fingerhut in May. Note: Although the designations had not been announced by the end of this fiscal year, the Center was designated a Center of Excellence in Transportation and Logistics in July.
- The ITI/UTC was a major sponsor and a presenter at the Ohio Conference on Freight 2009 which was held on The University of Toledo Health Science Campus.

ODOT FUNDS UT-UTC RESEARCH FOR SOLAR SKYWAY



The first research project that was funded by the Ohio Department of Transportation with the UT University Transportation Center also included a first for ODOT. The project titled "Veteran's Glass City Skyway Solar Array Field Demonstration" involves the installation for two solar arrays in the interchange at the northern end of the Veteran's Glass City Skyway bridge on I-280. The arrays will generate power to electrify the bridge and the colored pylon in its center. This is the first state DOT funded solar project on a highway right of way.



The \$1.5 million installation of the solar arrays is managed by Advanced Distributed Generation (ADG), a Toledo company closely associated with The University of Toledo. The solar panels will be provided by First Solar and Xunlight, both of whom have a close association with UT faculty and have facilities in Northwest Ohio.

The \$500,000 research component of the project is housed in the UT College of Engineering. Graduate students under the direction of Dr. Thomas Stuart, professor of Electrical Engineering, will collect data from the solar arrays for one year. The data will be analyzed and evaluated to determine the feasibility for the future use of solar projects on their property. Two kiosks, one at the University's College of Engineering on the UT Main Campus and the other at the I-75 northbound rest stop near Bowling Green, Ohio will include real time displays of the solar activity as well as other educational information about solar power.

Power generation is scheduled to start in early 2011. Completion of the research study is scheduled for March 2012. Director Rich Martinko is the PI for the total project.

Congresswoman Marcy Kaptur who provided the funding for the 100 kilowatt solar installation has nicknamed the bridge the "Solar Skyway."

ODOT & UT-UTC TACKLE ICING PROBLEM ON TOLEDO'S GLASS CITY SKYWAY BRIDGE



The Veteran's Glass City Skyway (VGCS) is a large cable-stayed bridge in Toledo, Ohio owned by the Ohio Department of Transportation (ODOT). The VGCS carries I-280 over the Maumee River. Four times in the three winters the VGCS has been in service ice has formed on the stay cable sheaths. Ice accumulations have been up to approximately 5/16" thick and the ice conforms to the cylindrical shape of the stay sheath. As the stays warm, they shed the ice in curved sheets that fall up to two hundred and fifty feet to the roadway and the pieces of ice can be blown across several lanes of traffic on the bridge deck. The falling ice sheets require lane closures and could present a potential hazard to the traveling public. To find a solution to this problem, ODOT funded the project "Ice Prevention or Removal on the Veteran's Glass City Skyway Cables." The project is housed in the UT-UTC. Douglas Nims, Associate Professor of Civil Engineering at UT, is the PI. The research team's goal for this project is to broadly define and cost several viable long term solutions to the ice falling from the stay cables.



The stay sheaths of the VGCS are unique: they are made of stainless steel, have a brushed finish, lack the usual helical spiral and have a large diameter. No existing ice anti/deicing technology was found to be practical for the VGCS.



Because of the unique nature of the problem, the need for a quick response and the specialized nature of the icing knowledge required, this problem has been addressed with an expert team. The team includes experts in icing from the U.S. Army Cold Regions Research and Engineering Laboratory and the NASA Glenn Icing Branch, the ODOT project managers from the bridge construction, the engineers who designed and implemented the existing structural strain measurement system on the bridge, and

experts in green technology. UT-UTC Director, Rich Martinko, who was ODOT's lead on the construction of the bridge when he was their Assistant Director, is a member of the team.

The project which started in March is to be completed in January 2011. The next phase will be implementation of the most promising solution.

(The majority of this article was provided by Dr. Nims.)

PRESTRESSING STRAND PROJECT GETS OPPORTUNITY FOR REAL WORLD TESTING THROUGH ODOT



The UTC projects "Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand," Phases I and II, showed promising results for determining the condition of prestressing strands in aging concrete bridges. But PI Doug Nims, Associate Professor of Civil Engineering at UT, and Co-PI Vijay Devabhaktuni, Assistant Professor of Electrical Engineering at UT, wanted to see how the method performed on a real bridge. Working with Ohio University and the University of Cincinnati, they got their chance.



The Ohio University project, funded by the Ohio Department of Transportation involved the destruction followed by the analysis of a variety of tests on a decommissioned box bridge in southern Ohio. The UT subcontract will allow magnetic nondestructive examination of the prestressing strands in several areas of the lower flange of the box beams using the technology developed in the UTC projects. Following the tests, the UT team will participate in the dissection of the bridge to determine the true area of the strand in the sample regions. The ODOT project will be completed in April 2011.

UT-UTC STUDENT-OF-THE-YEAR WALTER ANDERSON



Gregg Anderson, proud father of UT-UTC Student of the Year, Walter Anderson, at the awards dinner in Washington, DC.

Walter Anderson, who finished his master's degree in Mechanical Engineering from the University of Toledo, was named the UT-UTC Student of the Year 2009. Accompanied by his father, Gregg Anderson, he attended the Council of University Transportation Centers annual banquet in Washington, D.C. in January where he received his award. Along with fees and expenses for attending the Transportation Research Board conference, which began the day after the dinner, he received a check for \$1,000.

Walter graduated Cum Laude when receiving both his associate's degree and bachelor's degree in Mechanical Engineering. Currently, he is performing research related to magnetorheological (MR) fluids. More specifically he is researching a multi-axial MR mount for use in hybrid vehicles. The physics of the mount have been theoretically captured through a mathematical derivation of the equations of motion. These equations have been programmed and simulated. A fluid-structure interaction (FSI) simulation is being constructed to help verify the mathematical derivation through

a numerical solution. The simulation numerically solves Newton's second law and the Navier-Stokes equations simultaneously.

Walter enjoys collaborating in multi-disciplinary work groups and takes a results oriented approach to engineering problems. In his spare time he enjoys multi-cultural experiences, working on his car and learning different languages. He speaks French and is attempting to learn others. He is a member of the American Society of Mechanical Engineers (ASME) and enjoys participating in their activities.

He will begin work on a Ph.D. in engineering at UT in the fall.

UT-UTC CONTINUES SUPPORT OF THE UT SOLAR CAR TEAM



The North American Solar Challenge is a 2400 mile race from Dallas, Texas to Calgary, Alberta in a solar car that can go up to 65 miles per hour. The cars are built by students who raise the funding, design, test, transport, and race the cars.



Gordon Shaw of the UT Solar Car Teams answers questions from Ohio Governor Ted Strickland while he tours the Research & Technology Complex, the new home of the team.

The UT-UTC was the first sponsor of the UT Solar Car Team which started in 2009. This second year they have made significant progress: The designing of the chassis was completed along with the electrical power system. And, they were given permanent space to build their car in the Research and Technology Complex at UT.

The mechanical engineering (ME) team developed several different chassis designs before selecting one, based on a set of metrics. Detailed chassis design was then completed based on the selected design. This final chassis design was tested using finite element analysis to ensure that the design met safety standards. Any weak points that were found were reinforced and retested to ensure compliance. The finalized design was then submitted to the College of Engineering machine shop for construction.

The electrical engineering (EE) team began the final design of a boost converter, which is a critical part of the power system. The boost converter allows the solar panels to recharge the batteries by DC to DC power conversion. The final design was based on a set of design criteria that centered on safety and efficiency. This design was finalized and prototyped.

With strong support from the UT-UTC, the Team has been assigned 780 square feet of build space on the first floor of the Research and Technology Complex. The secure space will allow the Team to

store tools, parts, and computer and test equipment, alongside the car in a central location that is accessible to all Team members. It will also provide a place to hold the Team's regular meetings.

The UT-UTC assisted in securing the Team's space and helps with a variety of administrative and support issues.

FSAE ROCKET MOTORSPORTS SPONSORED BY THE ITI/UTC RACES ON E85



In conjunction with the UT-UTC, the ITI became a sponsor of the Formula Society of Automotive Engineers (FSAE) team – Rocket Motorsports.

This year running on E85 for the first time, the team placed 12th overall in the world competition at the Michigan International Speedway, May 12 -14, 2010. This race is the longest running and largest event for FSAE. The UT team has competed for 17 years ranking in the top ten five times. This is a significant accomplishment for a team that built their car for under \$10,000 this year. Other teams spend as much as \$125,000. The cars are evaluated on design, budget, professionalism, manufacturing techniques, and performance.



The 2009-2010 car, #43, reaches a top speed of 115 miles per hour with acceleration of 0 to 60 mph in 4 seconds.

Most major universities in the U.S. as well as teams from Europe, Australia, South America and Asia come to compete in the Michigan event. Before the race, the

UT group hosted the team from the Technical University of Munich for whom they provided housing and testing facilities for their car.

Read more about Rocket Motorsports, see all their cars from the past and watch their live webcam at <http://www.eng.utoledo.edu/~sae/>



THE MARITIME ACADEMY OF TOLEDO STUDENTS EXPAND LEARNING ON UT-UTC FUNDED FIELD TRIPS



In support of the UTC mission of educating transportation professional of the future, the UTC at The University of Toledo is assisting the students of The Maritime Academy of Toledo in getting real world experience by supporting field trips.

The Maritime Academy of Toledo is a publically funded, tuition-free charter school for grades 5 through 12 in Toledo, Ohio focusing on a maritime related education. They have become the first State of Ohio approved Maritime Career Tech Education Program.



The Maritime Academy Career Tech Education Program (MACTEP) is a career education program that enables graduates to go on to a two year or four year degree program leading to a merchant marine career or get an entry level position on a commercial vessel. Water transportation occupations are expected to grow at a rate of 15% through 2018 with good paying entry level jobs.

This year was an exciting one for the TMAT students as they moved into their new facilities with expanded space. Formerly a Simulation, Training, Assessment & Research (STAR) Center, operated by the American Maritime Officers (AMO), it is the perfect home for the Maritime cadets to develop real-life navigation skills using state of the art navigation, engine room, and radar simulators



ALTERNATE ENERGY TEAMS FUNDED FOR TOLEDO TECHNOLOGY ACADEMY HIGH SCHOOL STUDENTS

The Toledo Technology Academy (TTA) is a four-year high school in the Toledo Public School system. It is a College Tech Prep School that provides high-level academics and a manufacturing engineering technology curriculum. Many students from surrounding suburban school districts, as well as private schools, attend TTA as their preferred educational choice. For more information on TTA and the alternate energy team, see <http://www.toledotechnologyacademy.org/AltEnergyTeam.htm>



Senior team members on the biodiesel project are Ariana Newton, Will Scharer, Ken Miller and Tim Matthews

Automating a Biodiesel Processor

The objective of the biodiesel project at the Toledo Technology Academy funded by the UT-UTC was to automate a manually operated biodiesel processor.

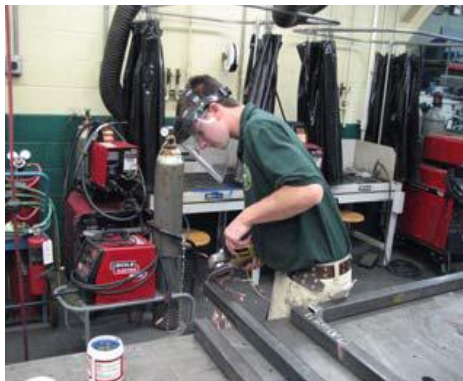
Along with the UTC funding for materials and supplies, industrial mentors from Libbey Glass, BP Refinery and the Center for Innovative Food Technology helped the students, who were part of the Alternate Energy Team, with the project. On April 16th and 17th, the team competed in the Society of Manufacturing Engineers national robotics challenge in Marion, Ohio as part of the work cell robotics category which includes automated systems. They finished in second place.

The Team completed the project on time and within budget. The processor is completely automated and is wired so that a programmable Logic controller controls the process of making biodiesel. The students added a touch screen which enabled them to eliminate the manual push buttons which controlled the PLC and processor.

Bob Sintobin, TTA instructor and team advisor, offered that the UTC support enabled them to buy the proper parts to build their system which has enhanced the learning experience.

Building a Tribrid Vehicle

The Tribrid Vehicle project funded by the UT-UTC provided the funds for students of the Alternate Energy Team to build a solar/biodiesel/electric tribrid vehicle. Starting with an all electric 1996 model Club Car golf cart donated by the Bay View Retirees Golf Course, the students added a diesel engine/alternator set and solar panels to extend the driving range and provide built-in charging. Knowledge gained from the project could be applied to another fuel conversion project or could lead to conversion of a full sized vehicle.



A student works on the building of the support frame for the automated biodiesel processor.



Golf cart to morph into solar/biodiesel/electric tribrid vehicle through the efforts of members of the TTA Alternative Energy Team



Muddy, Toledo Mud Hens baseball team mascot, tries out TTA's Tribrid vehicle at the



The tribrid vehicle includes a biodiesel motor generator set consisting of a 3.5 horsepower Yanmar diesel engine and a 200 amp automotive alternator with external diode set which produces over 20 amps of 42 volt power to charge the batteries. The Sharp solar panel array produces up to 4 amps of power to charge the batteries. The solar array is protected from damage in an aluminum framed lexan enclosure. The vehicle draws about 25 amps of current when operating on level ground. The range of the vehicle is now essentially unlimited as it can run on the power generated by the solar array and the bio-diesel charging unit. The range on batteries alone is approximately 12-15 miles.

The vehicle body was replaced with a new Midnight Blue ABS body kit. Brake lights, turn signals and headlights were added to make the vehicle road worthy. Display lighting was added to illuminate the interior of the vehicle for indoor display. Perimeter lights were added to improve the visibility of the vehicle when on the road or in parades. Instrumentation was added that shows the voltage and amperage output by the solar array. A battery manager meter shows the approximate level of charge remaining as well as the net amp-hours of power that have entered or left the battery pack.

The vehicle was displayed at the Toledo Auto Show January 28– 31, 2010. It was observed by thousands of spectators and students discussed the project with many interested show patrons. Muddy and Mudonna, Toledo Mud Hens baseball team mascots, even took the time to hear the TTA Tribrid story.

The finished vehicle was driven in the Oregon (Ohio) Fest parade May 16, 2010 and was on display with students explaining its operation to passersby. This summer the tribrid vehicle will be shown in several other neighborhood festivals and parades and there are plans to participate in August at the Frog Town Fair "Green Product" exposition at the Erie Street Market in downtown Toledo.

STUDENTS PARTICIPATE IN TRAFFIC STUDY



Students preparing to do traffic count with Pat Etchie (second from left) of Mannick & Smith Group; Richard Daniel Scott (Civil Engineering) far left; Jason Klear (Civil Engineering) second from right and Karen Gallagher (Ph.D. student in Health Education with a cognate in Geography & Planning) far right.

When The University of Toledo wanted a traffic study done as part of a proposal to be submitted to the Ohio Department of Transportation for the safety upgrade of Dorr Street on the southern perimeter of the Main campus, they asked the UTC to become involved. Working with the engineering and consulting firm, Mannick & Smith Group, student volunteers were invited to conduct the traffic counts that would justify the need for the revisions. A two-mile section of this street which students cross to get to commercial establishments was rated by ODOT as the 19th highest crash HotSpot Non-Freeway section in the State of Ohio. The Dorr Street corridor has been the focus of several groups including the University as an area needing revitalization and redevelopment to provide a safer facility for pedestrians, bicycles, and vehicles.

Not only did the students who participated in the traffic study get an interesting first hand transportation experience but in addition, Patrick Etchie, Chief Planner at Mannick & Smith, invited the students for a tour of the company's facilities and gave each a certificate acknowledging their involvement in the study. The students were also encouraged to add this activity to their resumes.

The proposal was submitted by the City of Toledo. The announcement of an award is expected in late November or December 2010.

NETWORK OF SCHOLARS TO HOLD 4TH SYMPOSIUM IN SPAIN



The UT-UTC funded project "Global Supply Chain Management/Transportation: Building a Global Network of Scholars and Educators" has held three symposiums and workshops since 2007 in three different countries: The University of Toledo, Ohio (USA) in 2007, Pusan National University (Korea) in 2008 and PSGIM (India) in 2009.

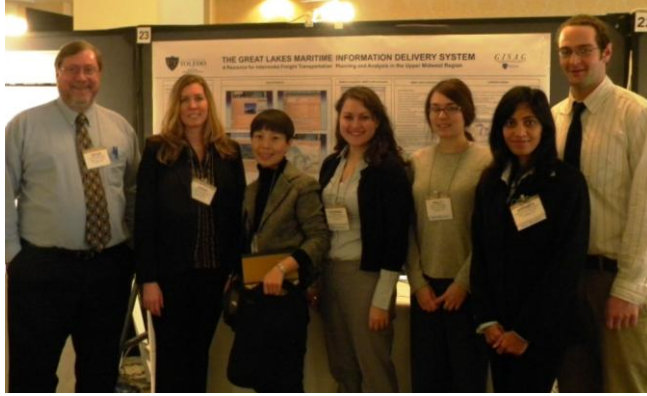
The fourth International Supply Chain Management Symposium and Workshop (IGSCC) will be held in Madrid, Spain on the campus of the IE Business School on September 23-24, 2010. The theme of this symposium is "Challenges and Opportunities for Supply Chains in Turbulent Times." The conference is being organized by the IE Business School (Madrid, Spain), The University of Toledo (Toledo, USA),

and PSGIM (Coimbatore, India). The fourth Supply Chain Management Symposium and Workshop provides a platform for professionals, practitioners, academics, educators and researchers in the field of Supply Chain Management and related areas to disseminate and share the latest research results, knowledge, and experiences in the field. For further information on the symposium and workshop, see <http://symposiumscm2010.ie.edu/>

IE Business School is an international higher education institution based in Madrid offering doctoral and master's degrees. They were ranked number three in Europe and number six worldwide in International MBA programs by the *Financial Times* in 2010.

The other Universities that lead these conferences include the University of Tokyo and Waseda University (Japan) and Kyungpook National University (Korea). Further information on the project can be found at <http://www.utoledo.edu/research/UTUTC/network.html>

FREIGHT STUDY GROWS INTO MULTIFACETED DATA RESOURCE



Dr. Peter Lindquist, Chair of the UT Department of Geography & Planning with his graduate students (from the left) Sarah Schafer, Xi Lu, Rosanna Violi, Kelly Rowand, Krithica Kantharaj, and Jeff Eloff in front of their poster at the TRB conference

Graduate Students Present Poster at TRB

The Great Lakes Maritime Information Delivery System: A Resource for Intermodal Freight Transportation Planning and Analysis in the Upper Midwest Region

The UT-UTC along with CFIRE (the UTC at the University of Wisconsin–Madison), the Great Lakes Maritime Research Institute (GLMRI), and the Army Corps of Engineers have funded the development of The Great Lakes Maritime Information Delivery System (GLMIDS). This

year the graduate students who worked on the System were able to attend the Transportation Research Board conference in Washington, D.C. in January and participate in a poster session describing this extensive database.

GLMIDS is a comprehensive data repository and information resource designed to provide a central focus for studying freight movements in the Great Lakes and St. Lawrence Seaway regions. When fully implemented this resource is envisioned to provide a regional perspective in reporting on the condition of the freight infrastructure among all modes and will provide a vehicle to bring together a diversity of organizations and professionals including port authorities, government agencies, MPOs, shippers, carriers, freight analysts, and researchers. The system will ultimately provide a single repository for regional data with convenient secure access to a comprehensive database.

DATA DELIVERY SYSTEM PRESENTED AT THE 2009 OHIO CONFERENCE ON FREIGHT



Geography & Planning graduate students helped Director Martinko with the presentation at the Freight Conference: (from the left) Kelly Rowand, Krithica Kantharaj, Rosanna Violi, and Xi Lu



Director Rich Martinko and graduate students from the Department of Geography and Planning were presenters at a workshop titled "The Great Lakes Maritime Research Information Clearinghouse – University Transportation Research Benefitting the Freight Movement Industry" at the Ohio Conference on Freight 2009. This third annual conference was held September 22nd and 23rd at The University of Toledo Dana Center on the Health Science campus. The UT-UTC was a major sponsor of the event. The development of the Clearinghouse was supported in part by the UT-UTC. The presentation gave attendees a hands-on look at the extent and capabilities of the database.

The Information Clearinghouse is a resource for public policy decisions and a link between maritime freight movements, economic viability, and environmental quality in the Great Lakes, and supports the promotion of sustainable maritime transportation in the region. For more go to <http://www.maritime.utoledo.edu/H>. A Data Viewer user name and password can be requested from Samir Dhar at Hsamir.dhar@utoledo.edu.

DIRECTOR MARTINKO HOSTS INTERMODAL PROJECT MEETINGS



As a result of the Joint Intermodal Task Force appointed by the Mayor of the City of Toledo, the upgrade of the Norfolk and Southern intermodal yard in Toledo, Ohio (known as Airline Junction) was identified as an economic development priority. Armed with facts and figures from an economic impact study funded by the City and the UT-UTC, the project was awarded \$12.76 million in Transportation Project Federal Recovery Act Resources and State of Ohio monies.

Director Martinko was a lead member on the Task Force, PI on the economic study, the primary contact with Norfolk Southern, the interface with the City, and with the Ohio Rail Commission. On July 10, 2009, the UT-UTC hosted a meeting attended by all of the parties involved to map out the strategy, timeline, and accountabilities necessary for the management and completion of the project. By the end of the session, all agreed that having everyone sit together to discuss the project plan and resolve any probable difficulties was extremely helpful.

On July 30, 2009, the City held a public meeting to enable open discussion of the project. Held on The University of Toledo campus adjacent to the Airline Junction site, the Director took the opportunity to educate those attending, primarily neighbors of the rail yard, of the economic benefits to the community, how the project developed, where the funding came from, and how the project would proceed. City of Toledo administrators and elected officials, members of the Joint Intermodal Task Force, and representatives from Norfolk Southern were in attendance to answer questions posed by the audience. The exchange of information included the "neighbors" learning details of the project and the "experts" gaining knowledge from the people who live next to the railroad yard. By the end of the evening the predominant mood was acceptance of the project and the shared belief that it would be good for Toledo.

Following these gatherings, the Director held several meetings with Task Force members, Norfolk Southern representatives, City of Toledo administrators, academics, and marketing people to plan a strategy in support of the project. These meetings considered the best way to disseminate information to businesses who could benefit from the expansion of the intermodal capability, identify products and services that could gain from the project, and develop a plan for expanding distribution facilities in the area.

The Airline Junction construction began May 2010 and will be completed by the end of the year.

ITI/UTC NOMINATED UT CENTER OF EXCELLENCE



When The University of Toledo, along with the other state-assisted universities in the University System of Ohio (USO), was called upon to present programs considered for designation as USO Centers of Excellence, the UT administration chose the Intermodal Transportation Institute/University Transportation Center as one of three to be presented to the Chancellor during his visit to campus.

Director Martinko's presentation not only highlighted the work done as a UTC, but

also how that work and the information gathered as part of its projects supported the economic development initiatives of the region and the State. With the ITI/UTC not only an established resource for transportation and logistics data, but also an acknowledged contact point for assembling the parties needed to put together a successful project, the Center has brought together academics, practitioners and community leaders. This hands-on application to real problems has become a distinguishing feature of the ITI/UTC.

(Shortly after the end of this fiscal year, the UT ITI/UTC was announced as an Ohio Center of Excellence in Transportation and Logistics – the only such designation in the state.)

UT-UTC INTEGRAL IN META-PLAN REGIONAL TRANSPORTATION REPORT



Recognizing that transportation and logistics is the cross-cutting foundation of the Toledo, Ohio economy in its present transition, a working group was formed to identify strategies and action plans that take full advantage of the strategic geography and transportation assets of the region as part of a Meta-Plan. The working group was led by The University of Toledo UTC, the Toledo Metropolitan Area Council of Governments, and the Toledo-Lucas County Port Authority. This group produced a draft report in September of 2009 that defines strategies that leverage past transportation investments and identifies opportunities for future economic growth.

The draft document can be accessed at <http://www.utoledo.edu/research/ITI/>

ITI COMPLETES THREE YEAR BIODIESEL FUEL STUDY



The three year \$1.48 million biodiesel study funded by the U.S. Department of Transportation and lead by the Intermodal Transportation Institute (which houses the UT-UTC) was completed. The links to the executive summary, final report and combined three year report can be found at www.utoledo.edu/research/iti/biodiesel.html

The overview, background and recommendations from the executive summary follow.

OVERVIEW AND BACKGROUND

With the vision and leadership of Congresswoman Marcy Kaptur, the Toledo Area Regional Transit Authority (TARTA) and the Intermodal Transportation Institute (ITI) at The University of Toledo developed a long-term, large-scale comprehensive research project to understand and assess the impacts of using a mixture of renewable bio-fuel and diesel fuel (B20: 20% bio-fuel and 80% diesel) compared to currently available diesel fuel. Efforts to initiate the study began in the late summer of 2005. The City of Toledo had three vehicles operating on B20. TARTA selected thirty-eight Thomas buses with 2003 Detroit Diesel MBE 900 engines and ten Bluebird buses with 2006 Cummins ISB engines. Half of each type used ULS diesel and the other half used B20 made with ULS diesel. There were no significant problems in switching from diesel to biodiesel, or problems with operations. The mechanics who worked on the vehicles did not see a significant difference between working on vehicles using standard diesel versus biodiesel, and a survey of drivers showed a slight preference for vehicles burning biodiesel.

POLICY RECOMMENDATIONS AND FUTURE STUDIES

It is clear from this study, that the environmental advantages of B20 over standard diesel are substantial and that the economic advantages of standard diesel over B20 on a unit cost basis have reversed recently. Biodiesel offers significant greenhouse gas emissions reductions compared to its petroleum counterpart and has one of the best energy balances of any fuel available. However, in this study, B20 suffers a fuel cost per mile disadvantage because B20 delivers a lower mile per gallon in stop and go driving, which offsets B20's lower purchase price. Supporting the use of B20, is the fact that B20 is made with energy grown/produced in the U.S., so the use of B20 reduces the United States' negative trade balance and increase economic activity. Biodiesel creates meaningful jobs, strengthens the economy, and increases energy and homeland security. Depending upon the assumptions, the precise advantages are difficult to measure precisely. Each year in the United States, the use of biodiesel replaces tens of millions of barrels of petroleum, adds about \$4 billion to the economy, reduces carbon monoxide, hydrocarbons, and other harmful emissions. Following are some recommendations that should be considered:

1. Requiring all public transit fleets to use at least B10 provided sufficient supply of biodiesel. As a result of this study TARTA will use B20 in all of its large bus fleet. This can be phased in over a few years so there is not an unexpected surge in demand.
2. Require all diesel sold in the U.S. to be at least B5 provided sufficient capacity of bio-fuel is available. John Hausladen, President of the Minnesota Trucking Association (MTA), spoke in favor of Minnesota's move to a B5 blend. "Due to the diligent work of the states biodiesel manufacturers and distributors, the MTA is confident that we will have no operational problems as we move to the B5 blend. In the long run, we believe the best solution for the state and the national economy is to adopt a single, nationwide diesel fuel standard. We believe that biodiesel can be an important

component in making this a reality. Before following through with this recommendation these items should be considered:

- a. Making this recommendation for the nation, clearly requires a careful examination of the supply and demand balance.
 - b. It requires additional research and development for engine design to determine how MPG and emissions can be optimized for biodiesel. There are engine parameters that can be adjusted, and one question is can these be set to get better performance from biodiesel. Support joint research with engine manufacturers to understand how engines can be redesigned/recalibrated to use B05 and other blends of biodiesel more effectively.
 - c. Before full-scale rollout, it would be useful to develop a research partnership with a university or group of universities and a large truck fleets like UPS or FedEx Ground to test the use of different biodiesel blends in over the road trucks. Is the fuel economy as measure in MPG or fuel cost per mile different in over-the-road trucks versus stop-and-go buses? What is the impact on truck maintenance and other life cycle cost issues.
3. It is recommended that windows be kept in closed position during heavy traffic to reduce penetration of exhaust emission pollutants from surrounding vehicles and also self exhaust. Because this part of the study involves testing of only two buses, it is recommended that more buses be used for testing before making a final conclusion on the public transport microenvironments using biodiesel and ultra low sulfur diesel.
 4. It is recommended that fine particulate analysis of exhaust gases and indoor air in the bus is expanded to study risk to human.
 5. It is recommended that fine particulate chemical analysis should be carried out to identify the sources of the pollution and in particular the fine particles.
 6. Polycyclic aromatic hydrocarbons should be monitored on a regular basis to understand the concentration of most carcinogenic substance in the bus.
 7. Laboratory and field studies should be conducted to understand the environmental impact of using biodiesel made from different raw material. This study focused only on soy based biodiesel.



**BIODIESEL
PARTNERS for
RENEWABLE
ENERGY**
Harvesting Energy Independence in Ohio



INTERMODAL TRANSPORTATION INSTITUTE
THE UNIVERSITY OF TOLEDO



H₂Engine Systems

ASSOCIATED RESEARCH PARTNERSHIPS & AFFILIATIONS

Partnership in the National UTC CFIRE



CFIRE
National Center for Freight & Infrastructure
Research & Education

In a continuation of work started by the ITI, The University of Toledo participates as a partner in the UTC at the University of Wisconsin-Madison, the National Center for Freight & Infrastructure Research & Education – CFIRE. See more about CFIRE at <http://www.wistrans.org/cfire/>

Partnership in the Michigan-Ohio UTC



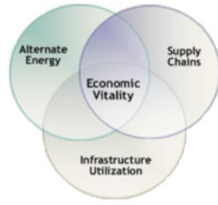
The University of Toledo is also a partner in the Michigan-Ohio University Transportation Center led by the University of Detroit – Mercy. Along with the other partners (Bowling Green State University, Wayne State University, and Grand Valley State University) UT participates in projects which share the same basic theme as the UT-UTC. The Director and the Vice President, Research Development both sit on the policy committee of the MIOH-UTC. See more about the MIOH-UTC at <http://mioh-utc.udmercy.edu/>

UT an Affiliate University at GLMRI



**Great Lakes Maritime
Research Institute**
*A University of Wisconsin - Superior and
University of Minnesota Duluth Consortium*

The University of Toledo is an affiliate university in the Great Lakes Maritime Research Institute, a coalition of the University of Wisconsin-Superior and the University of Minnesota-Duluth. See more about GLMRI at <http://www.glmri.org>



RESEARCH PROJECT STATUS LIST

New Projects

Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles - Phase III

Focus Area: Alternate Energy

Principal Investigator:

Mohammad Elahinia

Assistant Professor

Industrial and Manufacturing Engineering Department

The University of Toledo

Project Dates: 08/01/2009 – 07/31/2010; extended to 12/31/2010

Project Awarded: FY2010

Transportation Informatics: An Image Analysis System for Managing Transportation Facilities (Phase II of "A Novel Image Database System for Maintenance of Transportation Facility")

Focus Area: Infrastructure Utilization

Principal Investigator:

Eddie Y. Chou, Ph.D., P.E.

Professor and Director of Infrastructure Systems Research Laboratory

Department of Civil Engineering

The University of Toledo

Project Dates: 07/01/2009 to 06/30/2010; extended to 12/31/2010

Project Awarded: FY2010

Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand - Phase II

Focus Area: Infrastructure Utilization

Principal Investigator:

Douglas K. Nims, Ph.D., P.E.

Associate Professor, Civil Engineering

College of Engineering

University of Toledo

Project Dates: 07/01/2009 to 06/30/2010; extended to 12/31/2010

Project Awarded: FY2010

Strengthening of Bridge Columns Subjected to an Impact Lateral Load Caused by Vehicle Collision

Focus Area: Infrastructure Utilization

Principal Investigator:

Dr. Azadeh Parvin

Associate Professor

Department of Civil Engineering

The University of Toledo

Project Dates: 01/01/2010 – 12/31/2010

Project Awarded: FY2010

Value Of Its Information For Congestion Avoidance In Inter-Modal Transportation Systems, Phase III

Focus Area: Infrastructure Utilization

Principal Investigator:

Alper E. Murat, Ph.D.

Assistant Professor

Department of Industrial and Manufacturing Engineering

Wayne State University

Project Dates: 08/15/2009 – 08/15/2010; extended to 12/31/2010

Project Awarded: FY2010

A Data Library Management System for Midwest Freight View and its Data Repository

Focus Area: Infrastructure Utilization

Principal Investigator:

Dr. Peter Lindquist

Associate Professor

Department of Geography and Planning

The University of Toledo

Project Dates: 07/01/2009 to 06/30/2010; extended to 12/31/2010

Project Awarded: FY2010

Combined Truck Routing and Driver Scheduling Problems Under Hours-of-Service Regulations - Phase II

Focus Area: Supply Chains

Principal Investigator:

Dr. Hokey Min

James R. Good Chair in Supply Chain Strategy

Department of Management

College of Business Administration

Bowling Green State University, Bowling Green, Ohio

Project Dates: 07-01-2009 – 06/30/2010; extended to 12/31/2010

Project Awarded: FY2010

Ongoing Projects

Global Supply Chain Management/Transportation Building a Global Network of Scholars and Educators – II

Focus Area: Supply Chains

Principal Investigator:

Paul Hong, Ph.D.

Professor, Information Operations and Technology Management Department

The College of Business Administration, The University of Toledo

Project Dates: 08/01/2008 – 06/30/2010; extended to 12/31/2010

Project Awarded: FY2009

Completed Projects

A Novel Image Database Analysis System for Maintenance of Transportation Facility

Focus Area: Infrastructure Utilization

Principal Investigator – Changed to:

Eddie Y. Chou, Ph.D., P.E.

Professor and Director of Infrastructure Systems Research Laboratory

Department of Civil Engineering, The University of Toledo

Project Dates: 05/01/2008 – 04/30/2009; extended to 4/30/2010

Project Awarded: FY2008

Final Report: http://www.utoledo.edu/research/UTUTC/docs/UT-UTC-IU-5_Final_Report_6-201.pdf

Developing and Testing a Framework for Alternate Ownership, Tenure and Governance Strategies for the Proposed Detroit-Windsor River Crossing-Phase II

Focus Area: Infrastructure Utilization

Principal Investigator:

Snehamay Khasnabis, Ph.D., P.E.

Professor, Civil and Environmental Engineering

College of Engineering, Wayne State University

Project Dates: 08/01/2008 – 07/31/2009; extended to 12/31/2009

Project Awarded: FY2009

Final Report: In Review

Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand

Focus Area: Infrastructure Utilization

Principal Investigator:

Douglas K. Nims, Ph.D., P.E.

Associate Professor, Civil Engineering

University of Toledo

Project Dates: 01/01/2009 – 06/30/2009; extended to 12/31/2009

Project awarded: FY2009

Final Report: In Review

Regional Freight Information Resources in the Great Lakes Maritime Transportation System – Phase II

Focus Area: Infrastructure Utilization

Principal Investigator:

Peter Lindquist, Ph.D.

Associate Professor and Chair, Department of Geography and Planning

The University of Toledo

Project Dates: 05/01/2008 – 04/30/2009; extended to 9/30/2009

Project Awarded: FY2008

Final Report: http://www.utoledo.edu/research/UTUTC/docs/UTCLindquist_Phase_II_Final.pdf

Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles-Phase II

Focus Area: Alternate Energy

Principal Investigator:

Mohammad Elahinia, Ph.D.

Assistant Professor, Industrial and Manufacturing Engineering Department

The University of Toledo

Project Dates: 08/01/2008 – 07/31/2009; extended to 12/31/2009

Project Awarded: FY2009

Final Report: http://www.utoledo.edu/research/UTUTC/docs/UTUTC-AE-2_Final_Report.pdf

Value of ITS Information for Congestion Avoidance in Inter-Modal Transportation Systems, Phase II

Focus Area: Infrastructure Utilization

Principal Investigator:

Alper E. Murat, Ph.D.

Assistant Professor, Department of Industrial and Manufacturing Engineering

Wayne State University

Project Dates: 08/15/2008 – 08/15/2009; extended to 12/31/2009

Project Awarded: FY2009

Final Report: http://www.utoledo.edu/research/UTUTC/docs/UT-UTC-IU-10_Final_Report.pdf

High Speed Transportation Corridor: A Conceptual Framework

Focus Area: Supply Chains

Principal Investigator:

Udayan Nandkeolyar, Ph.D.

Associate Professor, Information Operations Technology Management

College of Business Administration, The University of Toledo

Project Dates: 05/01/2008 – 05/01/2009; extended to 6/30/2009

Project Awarded: FY2008

Final Report: http://www.utoledo.edu/research/UTUTC/docs/UTUTC-SC-7_Final_Report.pdf

Combined Truck Routing and Driver Scheduling Problems Under Hours-of-Service Regulations

Focus Area: Supply Chains

Principal Investigator:

Hokey Min, Ph.D.

James R. Good Chair in Supply Chain Strategy,

Department of Management, College of Business Administration

Bowling Green State University

Project Dates: 07/01/2007 – 02/28/2009; extended to 5/31/2009

Project Awarded: FY2007

Final Report: http://www.utoledo.edu/research/UTUTC/docs/UTUTC-HOS_Project_Final_Report.pdf

Travel Behavior of U.S. Domestic Airline Passengers and Its Impacts on Infrastructure Utilization

Focus Area: Infrastructure Utilization

Principal Investigator:

Bhuiyan M. Alam, Ph.D., M.ASCE

Assistant Professor, Department of Geography and Planning

The University of Toledo

Project Dates: 05/12/2008 – 05/11/2009

Project Awarded: FY 2008

Final Report: http://www.utoledo.edu/research/UTUTC/docs/Final_Report_Travel_Behavior.pdf

Value of ITS Information for Congestion Avoidance in Inter-Modal Transportation Systems

Focus Area: Infrastructure Utilization

Principal Investigator:

Alper E. Murat, Ph.D.

Assistant Professor, Department of Industrial & Manufacturing Engineering

Wayne State University

Project Dates: 08/14/2007 – 08/14/2008; extended to 12/31/2008

Project Awarded: FY 2008

Final Report:

http://www.utoledo.edu/research/ututc/docs/UT-UTC-IU-4_Final_Report_Murat.pdf

Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles

Focus Area: Alternate Energy

Principal Investigator:

Mohammad Elahinia, Ph.D.

Assistant Professor, Department of Industrial and Manufacturing Engineering

The University of Toledo

Project Dates: 08/01/2007 – 07/31/2008; extended to 12/31/2008

Project Awarded: FY 2007

Final Report:

http://www.utoledo.edu/research/ututc/docs/UTUTC-AE-1_Phase_I_Final_Report.pdf

Global Supply Chain Management/Transportation: Building a Global Network of Scholars and Educators

Focus Area: Supply Chains

Principal Investigator:

Subba Rao, Ph.D.

Professor, Information Operations Technology Management Department

College of Business Administration, The University of Toledo

Project Dates: 05/08/2007 – 12/31/2007; extended to 12/31/2008

Project Awarded: FY 2007

Final Report:

http://www.utoledo.edu/research/ututc/docs/UTUTC-SC-2_Final_Report_Revise.pdf

Developing and Testing a Framework for Alternative Ownership, Tenure and Governance Strategies for the Proposed Detroit-Windsor River Crossing

Focus Area: Infrastructure Utilization

Principal Investigator:

Snehamay Khasnabis, Ph.D., P.E.

Professor, Civil and Environmental Engineering

Wayne State University

Project Dates: 06/15/2007 – 09/30/2008; extended to 11/15/2008

Project Awarded: FY 2007

Final Report:

http://www.utoledo.edu/research/ututc/docs/UTUTC-IU-1_Final_Report1.pdf

Regional Freight Information Resources for Market Opportunities in the Great Lakes Maritime Transportation System

Focus Area: Infrastructure Utilization

Principal Investigator:

Peter S. Lindquist, Ph.D.

Associate Professor and Chair, Department of Geography and Planning

The University of Toledo

Project Dates: 05/03/2007 – 06/30/2008; extended to 08/31/2008

Project Awarded: FY 007

Final Report:

<http://www.utoledo.edu/research/ututc/docs/Lindquist UTC Phase I FinalReport.pdf>

Discontinued Projects

An Analysis of the Status and Impacts of Public Private Partnerships of the Indiana Toll Road

Focus Area: Infrastructure Utilization

Principal Investigator:

Hiroyuki Iseki, Ph.D.

Assistant Professor, Department of Geography and Planning

The University of Toledo

Project Dates: 08/16/2008 – 08/15/2009

Project Awarded: FY 2008

Note: The PI left the University before the work on the project was begun. Although the project had been funded it was cancelled.

PUBLICATIONS, PRESENTATIONS, THESES, DISSERTATIONS

Publications

Book Chapters

Motlagh, A., Abuhaiba, M. **Elahinia, M. H.**, and Olson, W., "Hydraulic Hybrid Vehicles in Environmentally Conscious Transportation," 2007, John Wiley and Sons, Hoboken, NJ, 2008. ISBN: 978-0-471-79369-4

Journal Publications

Published

Min, Hokey, "The Impact of Hours-of-Service Regulations on Transportation Productivity and Safety: A Summary of Findings from the Literature." *Journal of Transportation Management*, Vol. 21, No. 2, (2009): 49-64.

Melachroudis, Emanuel and **Min, Hokey**, "A Tabu Search Heuristic for Solving the Multi-Depot, Multi-Vehicle, Double-Request Dial-A-Ride Problem Faced by the Health-Care Organization." *International Journal of Operational Research*, in press.

Melachroudis, Emanuel, **Min, Hokey**, and Shah, Vidit D. "Combined Truck Routing and Driver Scheduling Problems under Hours of Service Regulations." *International Journal of Operations and Quantitative Management*, forthcoming.

Nguyen, T. M. and **Elahinia, M. H.**, "Vibration Isolation for Hydraulic Hybrid Vehicles," *Journal of Shock and Vibration*, February 2008, 15(2):193-204.

Ciocanel, C., **Elahinia, M. H.**, Molyet, K., and Naganathan, N., "Design, Analysis, and Control of a Magnetorheological Fluid Based Torque Transfer Device," *International Journal of Fluid Power*, November 2008, 9(3):19-24.

Mohaghegh-Motlagh, A. and **Elahinia, M. H.**, "Dynamic Force Profile in Hydraulic Hybrid Vehicles: A Numerical Investigation," *Vehicle System Dynamics*, July 2009:1744-5159.

Schroeder, C., **Elahinia, M. H.**, and Schumack, M. "Integrating Education and Research: Development of a Hydraulic Hybrid Vehicle Laboratory," *International Journal of Engineering Education*, December 2008, 24(6): 1217-1228.

Roh, James J., **Hong, Paul**, and Park, Youngsoo. Organizational Culture and Supply Chain Strategy: A Framework for Effective Information Flows. *Journal of Enterprise Information Management*, Vol. 21, No. 4, 2008, pp. 361-376.

Hong, Paul, Kwon, He-Boong and Roh, James. Implementation of Strategic Green Orientation: An Empirical Study of Manufacturing Firms, *European Journal of Innovation Management*, Vol. 12 No. 4, 2009, pp. 512-532.

Park, Youngwon, Koichi, Ogawa, Hirohumi, Tatsumoto, and **Hong, Paul**. "The Impact of Product Architecture on Supply Chain Integration: A Case Study of NOKIA and Texas Instruments," *International Journal of Services and Operations Management*. Vol. 5, No. 6, 2009, pp. 787-798.

Kang, Mingu, Wu, Xiaobo, and **Hong, Paul**. "Strategic Outsourcing for Sustainable Competitive Advantages: Case Studies of Multi-National Corporations (MNCs) in China," *Strategic Outsourcing: An International Journal*. Vol. 2, 2009, No. 3 pp. 240-256.

Hong, Paul, Dobrzykowski, David D. and Vonderembse, M. "Effective integration of e-technologies and lean practices: supply chain performance in product and service focused firms," *Benchmarking: An International Journal*. Vol. 17, No. 4, pp. 561-592, 2010.

Tomino, Takahiro., Park, Youngwon., **Hong, Paul**., and Roh, James. "Market Flexible Customizing System (MFCS) of Japanese vehicle manufacturers: An Analysis of Toyota, Nissan and Mitsubishi," *International Journal of Production Economics*. Vol. 118, No. 2. pp. 375-386. 2009.

Hong, Paul, Tran, Oahn and Park, Kiyun Park. "Electronic commerce applications for supply chain integration and competitive capabilities: An empirical study," *Benchmarking: An International Journal*. Vol 17, No. 4, 2010, pp. 539-560.

Accepted/In Review

Nguyen, T. M., Ciocanel, C., and **Elahinia, M. H.**, "A squeeze-flow mode magnetorheological mount: design, modeling, and experimental evaluation," *Journal of Vibration & Acoustics – Transactions of the ASME*, In Review.

Hong, Paul. Editorial: Emerging Issues in Services Operations Management *International Journal of Services Operations* (Accepted for Publication; In Press)

Dobrzykowski, D., Tran, Oahn and **Hong, Paul**. "Insights into integration approaches in service and product-focused firms for supply chain redesign". *International Journal of Services Operations Management* (Accepted for Publication, 2010; In Press)

Hong, Paul and Vonderembse, Mark. Emerging Global Logistics: "A Case of Korea Express". *International Journal of Logistics and Systems Management* (Accepted for Publication, September 10, 2009; In Press).

Park, Youngwon, **Hong, Paul**., and Hwang, Woosang, "Suppliers Support of Manufacturers for Supply Chain Integration : A Case study of Korean Hyundai-Kia firms". *International Journal of Logistics and Systems Management* (Accepted for Publication, September 10, 2009; In Press)

Junichi Tomita, Youngwon Park , **Hong, Paul**. "Supply Chain Management of Glass Industry: From a Viewpoint of Product Architecture". *International Journal of Services and Operations Management* (Accepted for Publication August 10, 2009; In Press) .

Tomino, Takahiro, **Hong, Paul** and Park, Youngwon. "An Effective Integration of Manufacturing and Marketing System for Long Production Cycle: A Case Study of Toyota Motor Company", *International Journal of Logistics and Systems Management* (Accepted for Publication, November 2009; In Press).

Conference Publications and Presentations

Melachrinoudis, Emanuel and **Min, Hokey**, "Truck Routing and Driver Scheduling under Hours of Service Regulations." Presented at the 24th European Conference on Operational Research (EURO), Lisbon, Portugal (July 14, 2010).

Ciocanel, C., Nguyen, T., **Elahinia, M.** and Naganathan, N. G., "On the Design of a Combined Squeeze-Flow Mode Magnetorheological Fluid Mount," SPIE Smart Structures and Materials, March 14-22, 2007, San Diego, California.

Mohaghegh Motlagh, A., **Elahinia, M. H.**, Abuhaiba, M., and Olson, W., "Application of Smart Materials for Noise and Vibration of Hydraulic Systems," ASME DETC/CIE, September 4-7, 2007, Las Vegas, Nevada.

Nguyen, T., Ciocanel, C. Schroeder, C. and **Elahinia M.**, "On the Design and Control of a Squeeze-Flow Mode Magnetorheological Fluid Mount," ASME DETC/CIE, September 4-7, 2007, Las Vegas, Nevada.

Nguyen, T., Ciocanel, C., and **Elahinia M.**, "Performance of an Adaptive Magnetorheological Fluid Mount," ASME International Mechanical Engineering Congress, November 11-15, 2007, Seattle, Washington.

Nguyen, T. M., Ciocanel, C., Schroeder, C., and **Elahinia, M. H.**, "Performance of a Mixed Mode MR Mount," 10th Cansmart Meeting International Workshop on Smart Materials and Structures, October 10-11, 2007, Montreal, Quebec, Canada.

Ciocanel, C., Nguyen, T., and **Elahinia, M.**, "Design and modeling of a mixed mode magnetorheological (MR) fluid mount," SPIE Smart Structures and Materials, March 9-13, 2008, San Diego, California.

Ciocanel, C., Nguyen, T., M., and **Elahinia, M. H.**, "An Adaptive Magneto-hydraulic Vibration Isolator," 3rd International Conference, Advanced Concepts in Mechanical Engineering, Iasi, Romania, 5 - 6 June 2008.

Nguyen, T., Ciocanel, C. and **Elahinia M.**, "Parameter optimization in designing an MR mount," 15th International Congress on Sound and Vibration, 6-10 July 2008, Daejeon, Korea.

Nguyen, T., Ciocanel, C. and **Elahinia, M. H.**, "Theoretical and experimental development of a semi-active mount," ASME International Mechanical Engineering Congress, October 31 - November 6, 2008, Boston, Massachusetts.

Nguyen, T. M., Ciocanel, C. and **Elahinia, M.**, "Analytical modeling and experimental validation of a magnetorheological mount" Proceedings of SPIE Smart Structures and Materials, March 8-12, 2009, San Diego, California.

Nguyen, T., Ciocanel, C. and **Elahinia, M. H.**, "A Magnetorheological Mount for Hydraulic Hybrid Vehicles," SMASIS09 ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems September 20 - September 24, 2009, Oxnard, California.

Wang, S., The, N., Anderson, W., Ciocanel, C. and **Elahinia, M.**, "Skyhook Control of a Mixed Mode Magnetorheological Fluid Mount," ASME International Design Engineering Technical Conferences (IDETC), August 15-18, 2010, Montreal.

Anderson, W., Wang S., Nguyen, T., Ciocanel, C. and **Elahinia, M.**, "Comparison of a hydraulic engine mount to a magnetorheological engine mount," SAE Commercial Vehicle Engineering Congress, October 5-8, 2010, Rosemont, Illinois.

Conference Papers presented at the 3rd Symposium and Workshop in Global Supply Chains by UT faculty and UT Ph.D. students (Coimbatore, PSG Institute of Management, India)(January 7-9, 2010) (16)

Udayan Nandkeolyar¹ and Oanh T.K. Tran². "High Speed Transportation Corridor: A Conceptual Framework", Information Operations and Technology Management. ^{1,2}University of Toledo, USA.

James A. Pope¹ and Dieter Bartmann², "Securing Data Biometrically", ¹University of Toledo, USA, ²Universität Regensburg, Germany.

Sufian Qrunfleh¹, Monideepa Tarafdar² and **T. S. Ragu-Nathan**³. "Alignment of Supply Chain Management Practices and the Usage of Information Systems: Impact on Supply Chain Performance and Firm performance". ^{1, 2, 3}Universtiy of Toledo, USA.

Paul Hong¹, He-Boong Kwon² and James Jungbae Roh³, "Effective Environmental Business Practices for Successful Outcomes: An Empirical Study of Manufacturing Firms", ¹University of Toledo, USA, ²Concord University, USA and ³Pennsylvania State University Brandywine Campus, USA.

David D. Dobrzykowski¹, Oanh T.K. Tran², & **Paul C. Hong**³, "Supply Chain Redesign for Green Innovation Products: A Complimentarity Approach between Absorptive Capacity and Value Co-creation", ^{1,2,3} The University of Toledo, USA.

Conference Papers presented at the 4th Symposium and Workshop in Global Supply Chains by UT faculty and UT Ph.D. students (Madrid, Spain, September 22-24, 2010)

David M. Nelson¹, **Mark Vonderembse**² and **S. Subba Rao**³, "Life Cycle Evaluation Strategies of Biodiesel Fuel Along the Supply Chain in Public Transport", ^{1,2,3}The University of Toledo, USA.

Gyewan Moon¹, **Paul Hong**², Jongheon Kim³, Choongshin Park⁴, "Effective Implementation of Communities of Practices (CoP) in Knowledge Habitus: A Case Illustration", ^{1,3} Kyungpook National University, Korea, ²University of Toledo, USA, ⁴Samsung Electronics, Korea.

Koichi Ogawa¹, Youngwon Park², Hirofumi Tatsumoto³, "Semiconductor Device as an Artificial Genome in Global Supply Chain System", ¹The University of Tokyo, Japan, ²Waseda University, Japan, ³Ritsumeikan University, Japan.

Junichi Tomita¹, Youngwon Park², **Paul Hong**³ "Supply Chain Management of Glass Industry: From a Viewpoint of Product Architecture". College of Business Administration, ¹University of Toyko University, Japan, ²Waseda Institute for Advanced Study, Waseda University, Japan and ³University of Toledo, USA.

Takahiro Tomino¹, **Paul Hong**², Youngwon Park³. "Market Adaptive Production System of Japanese Vehicle Manufacturers: With Special Focus on Long Production Cycle". ¹School of Commerce, Meiji University, University of Toledo, USA and ³ Waseda Institute for Advanced Study.

Mingu Kang¹, Xiaobo Wu², **Paul Hong**³ and Youngwon Park⁴, "High-Tech SMEs and Global Production Network: A Case Study of Chinese IC Design Companies", ^{1,2}Zhejiang University, China, ³University of Toledo, USA, ⁴Waseda University, Japan.

Soon W. Hong¹, Cheng-Li Huang² and **Paul Hong**³, "TQM Practices and Innovation Performance: A Comparative Study of South Korea and Taiwan", ¹Youngdong University, South Korea, ²Tamkang University, Taiwan, ³University of Toledo, USA.

Mark Yang¹ and Ki-hyun Park², "Self-Service Technologies (SSTS): Determinants of Adoption and its Post-Usage Outcomes from a Focal Company Perspective", ^{1,2}The University of Toledo, USA.

Takashi Shimizu¹, Youngwon Park², **Paul Hong**³. "Supply Chain Risk Management and Organizational decision-making: A Case Study of Japanese Major Automotive Firm", ¹University of Tokyo, Japan, ²University of Tokyo, Japan ³University of Toledo, USA.

Youngwon Park¹, **Paul Hong**² and Woosang Hwang³, "Suppliers Support of Manufacturers for Supply Chain Integration: A Case Study of Korean Hyundai-Kia Firms", ¹ Waseda University, Japan, ^{2,3} University of Toledo, USA.

Youngsoo Park¹ and **Paul Hong**², "Coordinating Mass Customization for Rapidly Emerging Markets: A Human Resource Perspective", ^{1,2}University of Toledo, USA.

Takahiro Tomino¹, Youngwon Park², **Paul Hong**, "Build To Order System in Japanese Vehicle Manufacturers: Comparative Studies of Nissan, Toyota and Honda". ¹ Meiji University, Japan. ² The University of Tokyo, Japan, ³University of Toledo, USA - Best Research Paper Award 4th International Symposium and Workshop in Global Supply Chains.

Greg Rawski¹ and **Paul Hong**², "Sustainability Practices of Manufacturing Firms: An International Comparative Study", ¹ University of Evansville, USA and ² University of Toledo, USA.

Jehon Oh¹, Youngwon Park², **Paul Hong**³, "Global Production System of Korean Firms: Comparative Studies of Hyundai-Kia Motor Company and LG Electronics", ¹Meiji University, Japan. ²University of Tokyo, Japan, ³ University of Toledo, USA.

Kun Liao¹, Thomas Sharkey², T.S. Ragu-Nathan³, and **Mark Vonderembse**⁴, "Trust-Driven Joint Operational Activities to Achieve Mass Customization: A Comparative Study of U.S., Chinese and Japanese Companies", ¹ Central Washington University, USA. ^{2, 3, 4}University of Toledo, USA.

Paul Hong¹ and Seungchul Kim¹, "Business Network Excellence for Sustainable Competitive Advantage in Turbulent Environment: Case of Korean Firms", ¹ Hanyang University, Korea ² University of Toledo, USA.

Paul Hong¹, James Roh², "Collaborative Supplier Selection and Concurrent Product Design in the Context of Strategic Green Orientation: An Empirical Study", ¹ University of Toledo, and ²Rowan University, USA.

Vincent Whitelock, "Alignment between Business and Green Supply chain Management Strategies: A viable approach for improved business performance", University of Toledo, USA.

Se Youn Youn¹, Ma Ga Yang², **Paul Hong**³, "Four Types of Green Supply Chain Management from Contingency Theory Perspective", ¹Hongik University, Korea and University of Toledo, USA., ² and ³University of Toledo, USA.

Soon W Hong¹, **Paul Hong**², James Roh³, "A review of benchmarking practices: case for a new research area" ¹ Youngdong University, Korea, ² University of Toledo, USA, ³ Rowan University, USA.

Tchai Jitpaiboon¹, **Mark Vonderembse**², T.S., Ragu-Nathan³ The influence of top management support and information Technology utilization on supply chain integration. ¹ Ball State University, USA. ² and ³ University of Toledo, USA.

Hassan HassabElaby¹, Woosang Hwang², **Mark Vonderembse**³, "The impact of ERP implementations on organizational capabilities and performance", ¹ and ² and ³. University of Toledo, USA.

Sufian Qrunfleh¹, Monideepa Tarafdar¹, TS. Ragu-Nathan¹, "Identifying fit between Supply Chain and Information System", ¹ The University of Scranton, USA, ² and ³ University of Toledo, USA.

Dong Kyoonyoo¹, **Mark Vonderembse**², T. S. Ragu-Nathan³, "Knowledge management, cognitive empowerment, perspective, and innovation: A conceptual framework", ¹Virginia State University, USA, ² and ³ University of Toledo, USA.

Theses and Dissertations

James Wade, M.S. Thesis, "Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand", Spring 2010. Awarded outstanding M.S. thesis in the Department of Civil Engineering.

Bertrand Fernandes, M.S. Thesis, "Nondestructive Evaluation of Deteriorated Prestressing Strands Using Magnetic Field Induction", Spring 2010. Awarded outstanding M.S. thesis in the Department of Electrical Engineering and computer Science.

Amin Mohaghegh Motlagh, M.S. Candidate, "Modeling of a Bent-Axis Pump/Motor in Hydraulic Hybrid Vehicles to determine Reaction Force Components Leading to Vibration," July 2008; currently Ph.D. student Mechanical Engineering, University of Pittsburg.

Walter Anderson, M.S. Candidate, "Parametric Investigation Toward Achieving an Optimal Magnetorheological Mount," April 2010; University of Toledo UTC Student of the Year for 2009. Currently a Ph.D. student in the MIME Department University of Toledo.

The Nguyen, Ph.D. Student, "A novel semi-active magnetorheological mount for vibration isolation," July 2009. Currently a Visiting Assistant Professor at The University of Minnesota - Duluth.

ECONOMIC DEVELOPMENT PROJECT LIST

Completed Projects

Commodity Flow for the Toledo Region

Note: This project was funded with nonfederal matching funds. As stated in the abstract, the project is a direct extension of UT-UTC funded projects.

Principal Investigator:

Dr. Peter Lindquist
Associate Professor and Chair
Department of Geography and Planning
The University of Toledo
Toledo, OH 43606

Project Dates: 08/01/2008 – 06/30/2009; extended to 9/30/2009

Project Awarded: FY 2009

Final Report:

The results of this project were incorporated in the Norfolk Southern Airline Yard Intermodal Project final report *Airline Junction - Evaluating the Economic Impacts of Expanded Truck-Rail Intermodal Capacity in Northwest Ohio:*

http://www.utoledo.edu/research/UTUTC/docs/NS_Study_Final_Report.pdf

Norfolk Southern Airline Yard Intermodal Project

The project is a joint effort of The University of Toledo UTC and the City of Toledo.

Principal Investigator:

Richard S. Martinko, P.E.
Director, Intermodal Transportation Institute & University Transportation Center
The University of Toledo
Toledo, OH 43606

Project Dates: 01/01/2009 – 06/30/2009; extended to 12/31/2009

Project Awarded: FY 2009

Final Report: http://www.utoledo.edu/research/UTUTC/docs/NS_Study_Final_Report.pdf

UNIVERSITY EDUCATION PROJECT LIST

Completed Projects

Developing a Certificate Program in Transportation, Logistics, and Supply Chain Management

Principal Investigator:

Mark A. Vonderembse
Professor, Department of Information Operations and Technology Management
College of Business Administration
The University of Toledo

Project Dates: 05/05/2008 – 12/31/2008; extended to 12/31/2009

Project Awarded: FY 2008

Final Report: <http://www.utoledo.edu/research/ututc/docs/Coop-Final-Report.pdf>

Incorporating Intermodal Transportation into the Spatially Integrated Social Sciences

Principal Investigator:

Peter S. Lindquist, Ph.D.
Associate Professor and Chair Department of Geography and Planning
The University of Toledo

Co-Principal Investigators:

Hiroyuki Iseki
Assistant Professor, Department of Geography and Planning
The University of Toledo

Project Dates: 05/03/2007 – 06/30/2009; extended to 08/31/2009

Project Awarded: FY 2007

Final Report: http://www.utoledo.edu/research/ututc/docs/UTUTC_SISS_FinalReport.pdf

Development of a Secondary Level Education Program in Transportation, Logistics, and Supply Chain Management

Principal Investigator:

Doug Greiner
Department of Applied Organizational Technology
College of Business Administration, The University of Toledo

Project Dates: 05/05/2008 – 04/30/2009

Project Awarded: FY 2008

Final report: Pending

Web site: <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-SC-6.html>

Develop a Plan for Cooperative Education in Supply Chain Management at the Undergraduate Level

Principal Investigator:

Mark Vonderembse, Ph.D.

Professor, Information Operations and Technology Management Department

College of Business Administration, The University of Toledo

Project Dates: 09/01/2007 – 08/31/2008

Project Awarded: FY 2007

Final Report: <http://www.utoledo.edu/research/ututc/docs/Coop-Final-Report.pdf>

Global Supply Chain Management/Transportation Efficiency Systems Graduate Degree Program

Principal Investigator:

Subba Rao, Ph.D.

Professor, Information Operations Technology Management Department

College of Business Administration, The University of Toledo

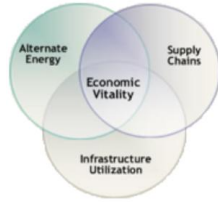
Project Dates: 05/08/2007 – 12/31/2007

Project Awarded: FY 2007

Web site: <http://www.utoledo.edu/research/ututc/researchprojects/UTUTC-SC-3.html>

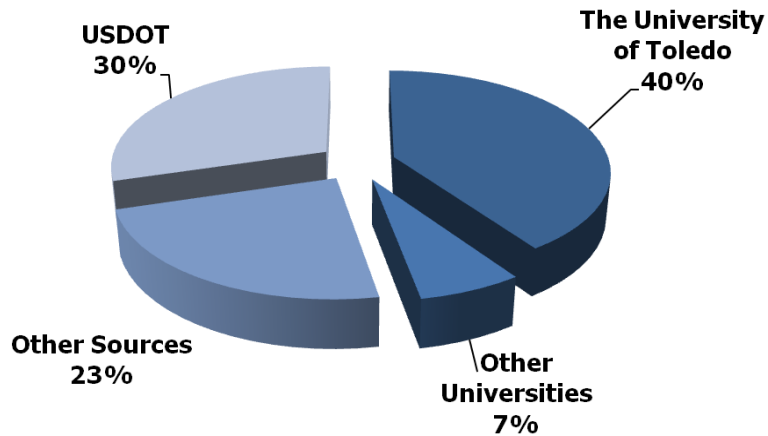
SUPPORTING U.S. DOT PRIORITIES

Meeting US Department of Transportation Priorities				
	Safety	Sustainability	Livability	Economic Recovery & Growth
UT-UTC Projects and Activities:				
A Data Library Management System for Midwest FreightView and its Data Repository				✓
Strengthening of Bridge Columns Subjected to an Impact Lateral Load Caused by Vehicle Collision	✓	✓		
Combined Truck Routing and Driver Scheduling Problems Under Hours-of-Service Regulations - Phase I & II	✓			
Regional Freight Information Resources for Market Opportunities in the Great Lakes Maritime Transportation System - Phase I & II		✓		✓
Global Supply Chain Management/Transportation Building a Global Network of Scholars and Educators - Phase I & II		✓		✓
Reducing Noise and Vibration of Hydraulic Hybrid and Plug-In Hybrid Electric Vehicles - Phase I & II & III	✓		✓	
Developing and Testing a Framework for Alternative Ownership, Tenure and Governance Strategies for the Proposed Detroit-Windsor River Crossing - Phase I & II	✓	✓		✓
Value of ITS Information for Congestion Avoidance in Inter-Modal Transportation Systems - Phase I & II & III	✓	✓	✓	
A Novel Image Database Analysis System for Maintenance of Transportation Facility - Phases I & II	✓		✓	
Magnetic Sensor for Nondestructive Evaluation of Deteriorated Prestressing Strand - Phases I & II	✓		✓	
Travel Behavior of U.S. Domestic Airline Passengers and its Impacts on Infrastructure Utilization		✓	✓	
High Speed Transportation Corridor: A Conceptual Framework	✓	✓	✓	✓
Studies directly related to transportation economic development projects and activities	✓	✓	✓	✓
Development of Airline Junction Intermodal Yard	✓	✓	✓	✓
Educating the Community: Intermodal presentations to public and private sector leaders & citizens	✓	✓		✓
Ohio Department of Transportation SPR Projects with the UT-UTC:				
Veteran's Glass City Skyway Solar Array Field Demonstration	✓		✓	✓
Ice Prevention or Removal on the Veteran's Glass City Skyway Cables	✓	✓	✓	
Intermodal Transportation Institute Research:				
Biodiesel Fuel Study			✓	

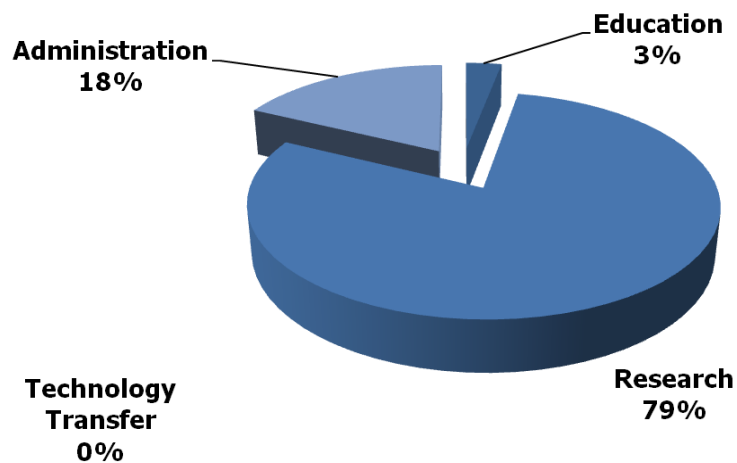


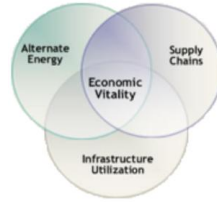
FUNDING SOURCES AND EXPENDITURES

FY 2009-2010 Funding Sources



FY 2009-2010 Expenditures





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