

# Center for Teaching Old Models New Tricks (TOMNET)

## A USDOT Tier 1 University Transportation Center

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### PROJECT PROPOSAL

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**Title:** An Exploration of Contemporary Issues in Highway Safety, Evolving Transportation Alternatives, and Activity and Travel Behavior Modeling

**Principal Investigator:** Michael Maness, Assistant Professor, Department of Civil and Environmental Engineering, University of South Florida

**Co-Principal Investigator:** Fred Mannering, Professor, Department of Civil and Environmental Engineering, University of South Florida

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### 1. Introduction/Problem Statement

Several critical issues have emerged in recent years in the fields of highway safety, alternative transportation modes, and activity and travel behavior modeling. Regarding highway safety, there is currently an ongoing methodological debate about the use of data-driven methods (machine learning, etc.), conventional statistics, statistical models that address unobserved heterogeneity, and causality models. The research team will provide an extensive review and assessment of these methodological alternatives and their potential application to highway safety. Next, there have been several recent studies that indicate that driver behavior is changing continuously over time in response changing vehicle technologies, changing behavior and utilization of social media and texting as well as other temporally shifting factors (Mannering, 2018). This has profound implications for highway safety and the development of safety policies and countermeasures. The intent of the safety portion of this study is to explore the temporal instability of driver behavior from various perspectives including the possible temporally shifting effects of aggressive driving and cellphone usage, two elements of driver behavior that are believed to be highly unstable over time. Statistical evidence of possible changes in the effects of these elements over time can help guide public policy and effect mitigation.

The study will also consider the effect of emerging transportation alternatives with regard to the following four options: 1) the market potential for shared autonomous vehicles, 2) the use of bike sharing as a potential auto-trip substitute, 3) the potential for peer-to-peer carsharing, 4) the role that socio-demographics and health-related factors play in ride sourcing behavior, and 5) the potential of subsidizing free electric vehicle charging infrastructure for household vehicle ownership. The first three of these options are part of the growing "sharing" economy concept, where limited resources are used more efficiently by sharing. While this seems to go against the grain of what has become standard American consumer behavior, there is evidence among the young that sharing may have potential to mitigate the adverse environmental effects of traditional transportation modes. Third sharing option, the renting of personal vehicles for monetary compensation (peer-to-peer car sharing) has become increasingly popular in the U.S., but yet surprisingly little is known about the attitudes, perceptions and decision process

through which individuals decide to offer their car for rent in such peer-to-peer carsharing. The fourth option seeks to understand the recent growth in the popularity of mobility-on-demand (ride sourcing such as Uber and Lyft) which has already substantially disrupted the transportation market by providing a variety of new transportation options. The fifth options seeks to understand establish an early estimate of the value of free charging in the United States to aid in understanding potential for accelerating electric vehicle adoption in the United States.

The collection of interpersonal (social) network data and its incorporation into activity and travel behavior models is a growing area of travel behavior research. Prior research has found evidence of a link between strong and weak social connections and variations in activity behavior. In previous research, the research team has explored the use of Lin's conceptualization of social capital and its division into expressive and instrumental resources (Lin 2001). These resources then lead to expressive and instrumental outcomes respectively. This study will propose to explore the theoretical significance of social capital on leisure activity behavior and residential choice. Using Lin's conception, aspects of activity behavior will be classified into expressive and instrumental outcomes. These efforts will lay foundational steps into developing social network-based activity-based modeling frameworks capable of predicting travel patterns under the adoption of disruptive technologies and analyzing socially focused policy factors such as social isolation.

## **2. Project Objectives**

Considering the above, the objectives of this project include:

1. Provide a review and assessment of alternate data analysis techniques as applied to highway safety. Write and publish a paper on this topic.
2. Using available crash data, estimate statistical models that consider temporal variations in the effects of aggressive driving behavior and cellphone/electronic device use while driving. Write and publish papers on each of these topics.
3. Consider other aspects of temporal instability relating to crashes in work zones and crashes involving large trucks by gathering data and estimating statistical models. Write and publish papers on these two topics.
4. Examine the literature on bike sharing and shared autonomous vehicles, gather data and estimate statistical models that determine factors that affect the likelihood of bike sharing replacing automobile trips, and gather data and estimate models that determine the likelihood of using, and concerns associated with using shared autonomous vehicles. Write and publish a paper on each of these topics.
5. Gather data and estimate statistical models to examine the roles that socio-demographics and health-related factors play in the use of ride-sourcing services. Write and publish a paper to provide initial insights and help guide future research in this topic.
6. To refine and administer a survey exploring the leisure activities outcomes as determinants of social capital processes from interpersonal social networks
7. To analyze social network and leisure activity data to explore the effects of social capital on activity behavior
8. To gather data and estimate statistical models to examine the roles that attitudes toward free product have on public acceptance and valuation of free electric vehicle charging infrastructure.

## **3. Proposed Methodology and Data**

To address the possible temporally shifting effects of aggressive driving and cellphone usage, highway crash data from the states of Florida and Kansas will be used to estimate random parameters logit models (with heterogeneity in the means and variances of random parameters) of the resulting crash occupant injury severities. Models will be estimated using annual data and likelihood ratio tests will be performed to determine if the parameter estimates are stable from year to year. If temporal instability is found, an assessment of individual parameter estimates will be conducted to determine if any individual parameter has temporally stable marginal effects. A thorough assessment of marginal effects, which measure the effect of individual explanatory variables on resulting occupant injury outcomes, will be made to assess the potential policy implications of the findings. In addition, using crash-injury data from Los Angeles and Florida, potential temporal instability in truck and work zone crashes will also be explored and assessed using similar methods.

To assess the market potential for shared autonomous vehicles, a survey consisting of 75 questions distributed to the American Automobile Association South in the United States in the spring 2015 will be used to estimate random parameters logit models of the probability of shared autonomous vehicle use and models of the probability of being concerned about safety, reliability, privacy or other factors.

To assess the possible use of bike sharing as a potential auto-trip substitute, data collected in the Spring of 2018 in the central Florida area will be used to estimate random parameters logit models of the probability that survey respondents used bike sharing one or more times per month and the probability that this usage displaced a potential automobile trip. This same data will also be used to assess the willingness of people to rent their cars to others as an alternate use of transportation resources (peer-to-peer carsharing). In this case, a random parameters ordered probit model will be estimated to determine the willingness to rent a personal vehicle with the possible outcomes of extremely unlikely, unlikely, unsure, likely, and extremely likely. Finally, again using the same survey data, the role that socio-demographics and health-related factors play in ride sourcing behavior will be assessed using a random parameters logit model to assess the frequency of ride sourcing usage as a function of a wide range of explanatory variables with a particular emphasis on health-related variables.

The second data source will be a web-based survey of US residents to be conducted that explores leisure activity frequency. It is expected that a sample of about 1250 respondents nationally will be used. This survey instrument will be refined from prior research to be more mobile friendly and easier for respondents to understand. Additionally, the sampling strategy will incorporate additional internet panel to account for respondent population differences. To explore activity variety and frequency, ordered choice or count data models will be used. Additionally, the incorporation of social capital data from a position generator and resource generator instrument will be incorporated into these models. Although these indicators can be incorporated directly, they are just indicators of more general constructs (such as social capital and access to social resources). Variable reduction techniques may be used to explore incorporating this social data as latent variables of the social constructs which will be incorporated into the traditional count and discrete choice models. Particularly, the use of integrated latent variable and choice models in the analysis of social interactions is a relatively unexplored area of empirical and methodological research. We propose to use such a model (or a similar one) to aid in inference about activity behavior and social capital.

In this research, we will establish an early estimate of the value of free charging in the United States. To solve this, this research program will analyze consumers' responses to a free charging program through a stated preference approach. Under this approach, different valuation behaviors would be explored through varying experimental scenarios. In these scenarios, the respondent would need to be presented with a charging location choice where two or more charging stations are presented with one charger being free and the others having a cost. After designing the stated preference survey, the acquiring survey data results will be analyzed in a discrete choice approach. Determining the value of free will entail adding a dummy variable to the model for when fueling cost is zero. Discrete choice models are versatile enough to determine the valuation through a ratio of coefficients and to determine if there is systematic taste variation in the value of free. Additionally, it is expected that this valuation will vary

across the population. To account for this variation, we will use a mixed choice model – including continuous mixtures using mixed logit and discrete mixtures using latent class logit models – to obtain population distributions of the value of free.

#### **4. Work Plan (Project Tasks)**

##### **Task 1: Contemporary issues in highway safety**

The analysis of transportation safety and travel behavior data is currently undertaken with a variety of methodologies, but a comprehensive assessment of these competing methodological approaches has not yet been undertaken. In addition, the issue of temporally stability of the effects of explanatory variables remains an important concern for safety and travel behavior polices. The following subtasks will be undertaken:

- 1.1 Review and assessment of alternate data analysis techniques as applied to highway safety: Undertake a review/position paper that examines the literature on methodologies used in the highway safety field including data driven methods, traditional statistical methods, heterogeneity methods and causal inference methods.
- 1.2 Temporal instability in aggressive driving behavior and cellphone/electronic device use: Undertake a statistical assessment using highway crash data from the states of Florida and Kansas, assess temporal effects, and write-up appropriate findings.
- 1.3 Temporal instability in large truck crashes and crashes in work zones: Undertake a statistical assessment using crash-injury data from Los Angeles and Florida, assess potential temporal instability in truck and work zone crashes, and write appropriate papers discussing procedures and results.

##### **Task 2: Assessment of emerging transportation alternatives**

Four assessments of emerging transportation alternatives will be considered: 1) the market potential for shared autonomous vehicles, 2) the use of bike sharing as a potential auto-trip substitute, 3) the potential for peer-to-peer carsharing, and 4) the role that socio-demographics and health-related factors play in ride sourcing behavior. The following subtasks will be undertaken:

2.1 Assessment of the market potential for shared autonomous vehicles: Estimate random parameters logit models of the probability of shared autonomous vehicle use and models of the probability of being concerned about safety, reliability, privacy or other factors. Write a paper describing estimation procedures and results.

- 2.2 Assessment of the use of bike sharing as a potential auto-trip substitute: Estimate random parameters logit models of the probability that survey respondents used bike sharing one or more times per month and the probability that this usage displaced a potential automobile trip. Write up appropriate findings.
- 2.3 Assessment of the potential for peer-to-peer carsharing: Estimate a random parameters ordered probit model to determine the of willingness to rent a personal vehicle with the possible outcomes of extremely unlikely, unlikely, unsure, likely, and extremely likely. Write a paper describing approach and findings.
- 2.4 Assessment of the role that socio-demographics and health-related factors play in ride sourcing behavior: Estimate a random parameters logit model to assess the frequency of ride sourcing usage as a function of a wide range of explanatory variables with a particular emphasis on health-related variables. Write a paper describing approach and findings.

### **Task 3: Survey refinement and analysis of leisure activity behavior through social capital**

Task 3 looks to refine the survey instrument and further explore the connections between activity variety and frequency and social capital. The following subtasks will be performed:

- 3.1 Refine Leisure Activity and Social Resources Survey: Analysis of past data indicated difficulties with inattentive respondents as well as mobile and technologically unsavvy users. A new sampling technique will be used incorporating internet panels across more than one provider (e.g. Qualtrics panels, Amazon MechanicalTurk). This will be used to account for inattentiveness. The survey questionnaire will be redesigned to account more specifically for use by both PC and mobile users. And the question will be more focused on differentiating instrumental and expressive social resource access.
- 3.2 Survey administration and data collection: This task involves the administration of the survey questionnaire to US household. Survey vendors will be selected in accordance with the refined sampling procedures to perform the recruitment of respondents. Respondents will be recruited and collection of survey responses will occur. After screening and cleaning the survey data, the team will compile electronic databases and thoroughly document the data. Data validity will be checked and documented.
- 3.3 Develop and implement models of leisure activity diversity and social capital: Models of activity diversity (e.g. count data models, fractional response models) will be developed to examine the impacts of social capital on activity behavior, specifically leisure activity diversity. In doing so, modeling methods may be developed to recognize and address the multidimensional nature of social capital indicators (as opposed to the typically used approach of treating indicators as unidimensional variables).
- 3.4 Explore the sensitivity of leisure activity diversity and social capital measures: The major concepts of interest in this study are latent and difficult to measure directly. Sensitivity analyses on the measures of activity diversity and instrumental and expressive social resource access will be performed. Determining the sensitivity of analyses to different versions of this measure will benefit efforts to incorporate such questioning in travel and activity surveys.

### **Task 4: Impacts of attitudes about free products on free public electric vehicle charging**

In the new data collection effort to understand the zero price effect on preferences for free electric vehicle charging, the work tasks will focus on survey design and administration. Specifically, the following subtasks will be undertaken:

- 3.1 Design of survey and sampling plan: In this task, the project team will design a stated preference survey to explore individual's value of free (free price effect) across various charging and vehicle scenarios. The survey will also ask respondents about their current vehicles and demographics about the household.
- 3.2 Survey pretest and revision: The survey will go through a period of refinement using tools from cognitive interviewing and trial tests. This will primarily be performed with short internet panels. This process will result in a revised survey questionnaire that will be ready for the main data collection task. Data from this trial will be cleaned and made accessible to the public.
- 3.3 Survey administration and data collection: This task involves the administration of the survey questionnaire to US households. A survey vendor will be selected to perform the recruitment of

respondents. The vendor may also be responsible for hosting the survey server. Respondents will be recruited and collection of survey responses will occur.

3.4 *Zero Price Effect Analysis*: The research team will conduct modeling and inference to provide distributional estimates of the value of free charging. The acquired dataset will be analyzed in a discrete choice approach. Determining the value of free will entail adding a dummy variable to the model for when fueling cost is zero. Discrete choice models are versatile enough to determine the valuation through a ratio of coefficients and to determine if there is systematic taste variation in the value of free. Additionally, it is expected that this valuation will vary across the population. To account for this variation, we will use a mixed choice model – including continuous mixtures using mixed logit and discrete mixtures using latent class logit models – to obtain population distributions of the value of free.

## 5. Project Schedule

The proposed project schedule is shown in the table below. It is expected that milestones will be accomplished after each subtask (at the end of that subtask’s final month). These are denoted in parentheses below the task labels.

Subtasks	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1.1 Review and assessment of alternate data analysis techniques as applied to highway safety (Paper completed)												
1.2 Temporal instability in aggressive driving behavior and cellphone/electronic device use (Two papers completed)												
1.3 Temporal instability in large truck crashes and crashes in work zones (Two papers completed)												
2.1 Assessment of the market potential for shared autonomous vehicles (Paper completed)												
2.2. Assessment of the use of bike sharing as a potential auto-trip substitute (Paper completed)												
2.3 Assessment of the potential for peer-to-peer carsharing (Paper completed)												
2.4 Assessment of the role that socio-demographics and health-related factors play in ride sourcing behavior (Paper completed)												
3.1 Refine Leisure Activity and Social Resources Survey (Questionnaire developed)												
3.2 Survey administration and data collection (Dataset collected)												
3.3 Develop and implement models of leisure activity diversity and social capital (Modeling vignette brief developed)												

3.4 Explore the sensitivity of leisure activity diversity and social capital measures (Paper completed)												
4.1 Design of survey and sampling plan (Questionnaire developed)												
4.2 Survey pretest and revision (Publicly available dataset created)												
4.3 Survey administration and data collection (Dataset collected)												
4.4 Zero Price Effect Analysis (Paper completed)												

## 6. Relevance to the Center Theme/Mission

This project’s application area in autonomous vehicles and vehicle safety features directly addresses FAST Act Research Priorities in (1) improving mobility of people and goods, (2) reducing congestions, and (3) promoting safety. This project will contribute to TOMNET’s mission to address barriers related to inclusion of attitudes in travel models. This will be done through data collection and analysis of attitudinal data. Additionally, the project seeks to develop code to estimate models with attitudinal data as well as to produce research addressing whether collecting attitudinal and social data can aid in addressing unobserved heterogeneity. In analyzing new data on social networks for social learning and temporal instability, this project will attempt to develop data procedures to understand and forecast changes in perceptions and attitudes. Addressing social effects in attitude formation will contribute to TOMNET’s other mission to address barriers related to forecasting attitudes similarly to socioeconomics.

## 7. Anticipated Outcomes and Deliverables

The project will result in the following deliverables:

1. Eleven working papers prepared for future submission to peer-reviewed journals
2. A technical report detailing the four phases of the project
3. Publicly available version of the electric vehicle charging behavior dataset
4. A modeling vignette brief on incorporating social capital data in activity behavior analysis

## 8. Research Team and Management Plan

Fred Mannering is currently the Associate Dean for Research in the College of Engineering and a Professor of Civil and Environmental Engineering (with a courtesy appointment in Economics) at the University of South Florida. His research interests are in the application of econometric and statistical methods to a variety of engineering problems, highway safety, transportation economics, automobile demand, and travel behavior. He has published extensively in these fields with over 140 journal articles and has coauthored two books: Principles of Highway Engineering and Traffic Analysis and Statistical and Econometric Methods for Transportation Data Analysis. He is also Editor-in-Chief of the journal Analytic Methods in Accident Research and previous Editor-in-Chief (2003-2012) and current Associate Editor for Transportation Research Part B.

Michael Maness is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of South Florida. His research interests are in the methodology and application of behavioral modeling in urban and regional systems. His dissertation, which was awarded the 2015 Eric Pas Dissertation Prize, involved incorporating social interactions into activity and travel behavior models. Maness is experienced in advanced choice models with applications to car ownership, electric vehicles, managed lanes, cycling, activity behavior, and communication behavior. His

professional experience has included a postdoc at Oak Ridge National Laboratory and a graduate research fellowship at Turner-Fairbank Highway Research Center. He has published articles in top transportation journals including Transportation Research Part B, Transportation Research Part A, and Journal of Transport Geography.

The team will be led by Michael Maness. Primary research responsibilities for (1) analyzing activity behavior and social capital will fall on Michael Maness and (2) assessment of safety and alternate transportation modes will fall on Fred Mannering. The team is expected to have internal communications biweekly and communication with the greater TOMNET team monthly. The PI and Co-PIs will supervise the student researchers with the student directly reporting to them weekly.

## **9. Technology Transfer Plan**

The technology transfer component of the project involves: (1) dissemination of project findings and outcomes in the form of conference presentations (such as the Transportation Research Board Annual Meeting) and peer-reviewed journal publications and (2) making the datasets available for public use through TOMNET's website. Additionally, project funds will be used to support the activities of the Journal of Public Transportation to promote public dissemination of research.

## **10. Workforce Development and Outreach Plan**

The project will directly provide career development opportunities for 6 doctoral students. The research effort will allow doctoral students to expand their technical skills into new areas of discrete choice modeling and transferability analysis. The supported doctoral students are expected to gain experience in managing research projects and mentoring undergraduate student researchers.

A student research competition will also be offered where students may submit research ideas in pursuit of funds to aid in the collection of travel behavioral surveys. Graduate students at the University of South Florida will be eligible to participate.

The project will include an educational component where data and information from the project will be provided to students to aid in their development. The PI and Co-PI both will teach graduate-level courses on econometric methods and data science. These courses will likely include homework assignments and a project component involving the analysis of transportation data. The past data collection effort on automated vehicles and/or activity behavior and social capital will be used in these efforts to expose students to real-world travel and activity data. Additionally, the classes will have components on data collection including questionnaire/survey design. Students will be exposed to the process that respondents partake of in providing travel data.

## **11. References**

- Mannering, F. (2018). Temporal instability and the analysis of highway accident data. *Analytic Methods in Accident Research*, 17, 1-13.
- Lin, N. (2001). Social capital: A theory of social structure and action. Cambridge University Press.



## 12. Qualifications of Investigators

### MICHAEL MANESS

Assistant Professor, Department of Civil and Environmental Engineering  
University of South Florida (USF), Tampa, FL 33620 Email: manessm@usf.edu

#### Education

Ph.D., Civil Engineering, University of Maryland, May 2015.

M.S., Civil Engineering, University of Maryland, December 2010.

B.S., Civil Engineering, University of Maryland, May 2009

B.S., Computer Science, University of Maryland, May 2009

#### Selected Employment and Professional Experience

Postdoctoral Scholar, Department of Civil and Environmental Engineering, USF, 2017-present.

Postdoctoral Research Associate, Center for Transportation Analysis, Oak Ridge National Laboratory, 2015-2016.

Graduate Research Fellow, Office of Operations Research and Development, Federal Highway Administration, 2013-2014.

#### Fields of Interest and Expertise

(1) Advanced discrete choice modeling; (2) agent-based modeling of people and freight; (3) The role of social networks and social interactions in decision making; (4) Forecasting emerging technologies in transportation; (5) Data collection and experimentation in transportation

#### Recent Relevant Publications

1. Maness, M. (2017). Comparison of position generators and name generators as social capital indicators in predicting activity selection. *Transportation Research Part A: Policy and Practice*, 106, 374-395.
2. Maness, M. (2017). A theory of strong ties, weak ties, and activity behavior: Leisure activity variety and frequency. *Transportation Research Record: Journal of the Transportation Research Board*, 2665, 30-39.
3. Calastri, C., Hess, S., Daly, A., Maness, M., Kowald, M., & Axhausen, K. (2017). Modelling contact mode and frequency of interactions with social network members using the multiple discrete-continuous extreme value model. *Transportation Research Part C: Emerging Technologies*, 76, 16-34.
4. Maness, M., & Cirillo, C. (2016). An indirect informational conformity social influence choice model: Formulation and case study. *Transportation Research Part B: Methodological*, 93, 75-101.
5. Maness, M., Cirillo, C., & Dugundji, E. (2015). Generalized behavioral framework for choice models of social influence: Behavioral and data concerns in travel behavior. *Journal of Transport Geography*, 46, 137-150.
6. Maness, M., & Cirillo, C. (2012). Measuring future vehicle preferences: Stated preference survey approach with dynamic attributes and multiyear time frame. *Transportation Research Record: Journal of the Transportation Research Board*, 2285, 100-109.

#### Recent Honors and Awards

Appointed as a Member of the Traveler Behavior and Values Committee (ADB10), Transportation Research Board, 2017-Present

2015 Eric Pas Dissertation Prize, International Association for Travel Behaviour Research, 2017

Outstanding Student of the Year, University Transportation Centers Program, 2015

Eisenhower Transportation Fellowship, Federal Highway Administration, 2010-2012, 2013-2014

## FRED L. MANNERING

Professor of Civil and Environmental Engineering  
University of South Florida, 4202 E Fowler Avenue, ENC 3506, Tampa, FL 33620

### Education

Ph.D.	Massachusetts Institute of Technology	1983
M.S.C.E.	Purdue University	1979
B.S.C.E.(with Distinction)	University of Saskatchewan	1976

### Research expertise

Application of advanced statistical and econometric methods to engineering problems, transportation safety analysis, transportation economics, automobile demand, and travel behavior.

### Professional History

Professor, Department of Civil Engineering (courtesy appointment, Department of Economics) at the University of South Florida (2015-present). Charles Pankow Professor of Civil Engineering (2009-2015), Professor of Civil Engineering (2001-2009), Head of the School of Civil Engineering (2001-2005) at Purdue University. Assistant, associate, and full professor during 14-year tenure at the University of Washington (1987-2001), Chair of the Department of Civil and Environmental Engineering at Washington (1997-2001). Assistant Professor, Department of Civil Engineering at the Pennsylvania State University (1983-1986).

### Publications/Presentations

Published 138 refereed journal articles, 2 text books (8 editions), 73 other publications (conference proceedings, project reports, book reviews and commentaries), and 103 presentations at professional conferences, 9 keynote speeches and distinguished lectures; and 37 invited talks.

### Citations

Published work has been cited over 6,000 times in the *Institute for Scientific Information* databases, over 7,500 times in Scopus, and over 17,000 times in Google Scholar.

### Funded Research

Principal investigator on 44 research projects with total funding of over 4 million dollars.

### Graduate Student Supervision

Supervised 25 PhD students (3 in progress, 14 currently in academic positions) and 45 MS students.

### Professional Activities and Awards

Founding Editor and Editor-in-Chief of Elsevier Science's Analytic Methods in Accident Research (2012-present), previously Editor-in-Chief of Elsevier Science's Transportation Research Part B: Methodological (2003-2012). Awards include: inclusion in the Eno Foundation's Top 10 Transportation Thought Leaders in Academia (2016); inducted into Purdue University's "Book of Great Teachers" (2013); Fellow, Purdue University Teaching Academy (2013-2015); Charles B. Murphy Outstanding Undergraduate Teaching Award, Purdue University's highest undergraduate teaching honor (2013); Arthur M. Wellington Prize; American Society of Civil Engineers, for the best paper in the Journal of Transportation Engineering (2010); James Laurie Prize, American Society of Civil Engineers (2009) "For his outstanding contribution to the advancement of transportation engineering through his influential research and publication in the area of highway safety"; Wilbur S. Smith Award, American Society of Civil Engineers (2005) "For outstanding contributions to the enhancement of the role of the civil engineer in highway engineering through excellence in teaching and research"; and the National Highway Safety Award (2001) for "A new method for prioritizing intersection improvements".

### 13. Budget Including Non-Federal Matching Funds

**Institution: University of South Florida**

**Project Title: Emerging econometric and data collection methods for capturing attitudinal and social factors in activity and travel behavior modelling**

**Principal Investigator: Michael Maness**

**Budget Period: 8/1/2019 - 07/31/2020**

CATEGORY	Budgeted Amount from Federal Share	Budgeted Amount from Matching Funds	Explanatory Notes; Identify Source of Matching Funds
Faculty Salaries	\$40,718	\$32,351	Salary for Fred Mannering and Michael Maness
Other Staff Salaries	\$0	\$0	
Student Salaries	\$65,000	\$0	Two 12-month GA's and one 6-month GA
Fringe Benefits	\$14,597	\$9,600	Faculty and Student Benefits
<b>Total Salaries &amp; Benefits</b>	\$120,315	\$41,951	
Student Tuition Remission	\$0	\$23,975	Tuition waivers for GA's (24/24/15 credits)
Operating Services and Supplies	\$1,856	\$0	
Domestic Travel	\$10,000	\$0	
Other Direct Costs	\$4,986	\$0	Survey distribution and data processing; student competition
<b>Total Direct Costs</b>	\$16,842	\$23,975	
F&A (Indirect) Costs	\$67,893	\$20,766	
<b>TOTAL COSTS</b>	\$205,050	\$86,692	

## Grant Deliverables and Reporting Requirements for UTC Grants (November 2016)

### Exhibit F

<b>UTC Project Information</b>	
Project Title	Emerging econometric and data collection methods for capturing attitudinal and social factors in activity and travel behavior modelling
University	University of South Florida
Principal Investigator	Michael Maness
PI Contact Information	Address: 4202 E. Fowler Ave, ENB 118 Tampa, FL 33620 Email: manessm@usf.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	US Department of Transportation (Federal UTC): \$205,050 University of South Florida (Cost Share): \$86,692
Total Project Cost	\$291,742
Agency ID or Contract Number	
Start and End Dates	09/01/2019 – 08/31/2020
Brief Description of Research Project	
Describe Implementation of Research Outcomes (or why not implemented)	
Place Any Photos Here	
Impacts/Benefits of Implementation (actual, not anticipated)	The eventual impact of this research will be to improve the accuracy of travel and highway safety forecasting models.
Web Links <ul style="list-style-type: none"> <li>• Reports</li> <li>• Project Website</li> </ul>	Reports will be made available on the TOMNET website.