



Application

01976 - 2015 Travel Demand Management (TDM)

03733 - Smartphone-based interventions for sustainable travel behavior

Regional Solicitation - Transit and TDM Projects

Status: Submitted
Submitted Date: 09/10/2015 2:27 PM

Primary Contact

Name:* Yingling Fan
Salutation First Name Middle Name Last Name

Title: Associate Professor

Department: Humphrey School of Public Affairs

Email: yingling@umn.edu

Address: 301 19th Avenue South

***:** Minneapolis Minnesota 55455
City State/Province Postal Code/Zip

Phone:* 612-626-2930
Phone Ext.

Fax:

What Grant Programs are you most interested in? Regional Solicitation - Transit and TDM Projects

Organization Information

Name: UNIV OF MN

Jurisdictional Agency (if different):

Organization Type: In-State not for profit

Organization Website:

Address: 158 HUMPHREY CTR
301 19TH AVE S

***** MINNEAPOLIS Minnesota 55455
City State/Province Postal Code/Zip

County: Hennepin

Phone:* 612-625-8575
Ext.

Fax:

PeopleSoft Vendor Number 0000003036A23

Project Information

Project Name Smartphone-Based Interventions for Sustainable Travel Behavior

Primary County where the Project is Located Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, Washington

Jurisdictional Agency (If Different than the Applicant):

The project will develop a smartphone-based behavior intervention tool for promoting travel mode shifts from driving to more sustainable modes. The effectiveness of the tool will be demonstrated through an intervention program, in which University of Minnesota (UMN) parking contract holders will be recruited to use the tool to achieve successful and lasting mode shift changes.

This project is a natural continuation of the project teams prior work on a smartphone-based tool named SmarTrAC (smartrac.umn.edu). SmarTrAC can automatically pinpoint origins and destinations of trips made by the user throughout the day as well as automatically identify trip modes, duration, and distance. Building upon SmarTrACs data collection capabilities, a new intervention-driven tool (namely SmarTrAC-Intervene) will be designed to provide customized messages and action plans to the user after detection of each driving trip. The tool will incorporate a combination of three strategies to promote mode shifts:

Brief Project Description (Limit 2,800 characters; approximately 400 words)

Awareness: Messages describing environmental impacts associated with each driving trip (e.g., carbon emissions) will be displayed to the user.

Motivation: Messages describing personal benefits of a mode shift (e.g., cost savings and health benefits) will be displayed to the user to reinforce positive aspects of transit and non-motorized travel.

Action: Implementable mode-shift plans will be provided to the user through the phone. For example, if the application detects a driving trip made from home to a grocery store, the new tool will utilize maps of bike rental facilities and public transit services to provide information on how to travel to the destination by alternative transportation modes, including information on where and how to rent a bike or board a bus/train as well as information on the best walking/biking/transit routes.

Collaborating with the Metro Transit and the UMN Parking and Transportation Services, the project team will test the effectiveness of the tool among UMN parking contract holders. Free \$20 Go-To-Cards will be used as incentives to recruit participants. Additional value will be added to the participants Go-To-Cards contingent upon meeting a minimum number of mode-shift trips as detected by the app. Based upon prior recruitment experiences, the project is estimated to directly impact at least 3,000 UMN car commuters, resulting in significant congestion mitigation and air quality impacts in the Twin Cities region. Further, the project will demonstrate the new tools feasibility for wide-scale deployment in the Twin Cities region, providing an innovative smartphone solution to promote a sustainable Multi-Modal Ecosystem in the region and enable future integration with Metro Transits Multi-Modal Mobility Ecosystem Initiative.

Include location, road name/functional class, type of improvement, etc.

Project Length (Miles)

0

Connection to Local Planning:

Reference the name of the appropriate comprehensive plan, regional/statewide plan, capital improvement program, corridor study document [studies on trunk highway must be approved by MnDOT and the Metropolitan Council], or other official plan or program of the applicant agency [includes Safe Routes to School Plans] that the project is included in and/or a transportation problem/need that the project addresses. List the applicable documents and pages.

Connection to Local Planning

Local plans have recognized that congestion on regional highways will get worse and that congestion mitigation requires innovative and multi-modal approaches. These plans include the Minnesota GO 50-Year Vision and the 20-Year Statewide Multimodal Transportation Plan by MnDOT, the Thrive MSP 2040 and the 2030 Transportation Policy Plan by Met Council, and the 2030 Comprehensive Plans by cities across the region, e.g., Minneapolis, St. Paul, Eden Prairie, Minnetonka, Bloomington, Edina, and Plymouth. Additionally, the recent MSP Urban Mobility Integration initiative by the McKnight Foundation, Nice Ride Minnesota, St. Paul Smart Trips, and Minneapolis Commuter Connection and the proposed Metro Transit Multi-Modal Mobility Ecosystem Initiative highlight the importance of integrated user interfaces among mobility-related smartphone tools. The proposed smartphone tool directly responds to these two initiatives by integrating data collection with behavior intervention capabilities.

Project Funding

Are you applying for funds from another source(s) to implement this project?	No
If yes, please identify the source(s)	
Federal Amount	\$300,000.00
Match Amount	\$75,000.00
<i>Minimum of 20% of project total</i>	
Project Total	\$375,000.00
Match Percentage	20.0%
<i>Minimum of 20%</i> <i>Compute the match percentage by dividing the match amount by the project total</i>	
Source of Match Funds	Metro Transit
Preferred Program Year	
Select one:	2015

MnDOT State Aid Project Information: Transit and TDM Projects

County, City, or Lead Agency N/A

Zip Code where Majority of Work is Being Performed 0

(Approximate) Begin Construction Date

(Approximate) End Construction Date

LOCATION

From:
(Intersection or Address) N/A

*Do not include legal description;
Include name of roadway if majority of facility
runs adjacent to a single corridor.*

To:
(Intersection or Address) N/A

Type of Work

*Examples: grading, aggregate base, bituminous base, bituminous surface,
sidewalk, signals, lighting, guardrail, bicycle path, ped ramps, bridge,
Park & Ride, etc.)*

Specific Roadway Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Mobilization (approx. 5% of total cost)	\$0.00
Removals (approx. 5% of total cost)	\$0.00
Roadway (grading, borrow, etc.)	\$0.00
Roadway (aggregates and paving)	\$0.00
Subgrade Correction (muck)	\$0.00
Storm Sewer	\$0.00
Ponds	\$0.00
Concrete Items (curb & gutter, sidewalks, median barriers)	\$0.00
Traffic Control	\$0.00
Striping	\$0.00
Signing	\$0.00
Lighting	\$0.00
Turf - Erosion & Landscaping	\$0.00
Bridge	\$0.00
Retaining Walls	\$0.00
Noise Wall	\$0.00
Traffic Signals	\$0.00

Wetland Mitigation	\$0.00
Other Natural and Cultural Resource Protection	\$0.00
RR Crossing	\$0.00
Roadway Contingencies	\$0.00
Other Roadway Elements	\$0.00
Totals	\$0.00

Specific Bicycle and Pedestrian Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Path/Trail Construction	\$0.00
Sidewalk Construction	\$0.00
On-Street Bicycle Facility Construction	\$0.00
Right-of-Way	\$0.00
Pedestrian Curb Ramps (ADA)	\$0.00
Crossing Aids (e.g., Audible Pedestrian Signals, HAWK)	\$0.00
Pedestrian-scale Lighting	\$0.00
Streetscaping	\$0.00
Wayfinding	\$0.00
Bicycle and Pedestrian Contingencies	\$0.00
Other Bicycle and Pedestrian Elements	\$0.00
Totals	\$0.00

Specific Transit and TDM Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Fixed Guideway Elements	\$0.00
Stations, Stops, and Terminals	\$0.00
Support Facilities	\$0.00
Transit Systems (e.g. communications, signals, controls, fare collection, etc.)	\$0.00
Vehicles	\$0.00
Transit and TDM Contingencies	\$0.00
Other Transit and TDM Elements	\$375,000.00
Totals	\$375,000.00

Transit Operating Costs

OPERATING COSTS	Cost
Transit Operating Costs	\$0.00
Totals	\$0.00

Totals

Total Cost	\$375,000.00
Construction Cost Total	\$375,000.00
Transit Operating Cost Total	\$0.00

Requirements - All Projects

All Projects

1. The project must be consistent with the goals and policies in these adopted regional plans: Thrive MSP 2040 (2014), the 2030 Transportation Policy Plan (amended 2013), the 2030 Regional Parks Policy Plan (amended 2013), and the 2030 Water Resources Management Policy Plan (2005).

Check the box to indicate that the project meets this requirement. Yes

2. Applicants that are not cities or counties in the seven-county metro area with populations over 5,000 must contact the MnDOT Metro State Aid Office prior to submitting their application to determine if a public agency sponsor is required.

Check the box to indicate that the project meets this requirement. Yes

3. Applicants must not submit an application for the same project in more than one funding sub-category.

Check the box to indicate that the project meets this requirement. Yes

4. The requested funding amount must be more than or equal to the minimum award and less than or equal to the maximum award. The cost of preparing a project for funding authorization can be substantial. For that reason, minimum federal amounts apply. Other federal funds may be combined with the requested funds for projects exceeding the maximum award, but the source(s) must be identified in the application. Transit expansion applications must be between \$500,000 and \$7,000,000. Transit System Modernization applications must be between \$100,000 and \$7,000,000. Travel Demand Management applications must be between \$75,000 and \$300,000.

Check the box to indicate that the project meets this requirement. Yes

5. The project must comply with the Americans with Disabilities Act.

Check the box to indicate that the project meets this requirement. Yes

6. The project must be accessible and open to the general public.

Check the box to indicate that the project meets this requirement. Yes

7. The owner/operator of the facility must operate and maintain the project for the useful life of the improvement.

Check the box to indicate that the project meets this requirement. Yes

8. The project must represent a permanent improvement with independent utility. The term independent utility means the project provides benefits described in the application by itself and does not depend on any construction elements of the project being funded from other sources outside the regional solicitation, excluding the required non-federal match. Projects that include traffic management or transit operating funds as part of a construction project are exempt from this policy.

Check the box to indicate that the project meets this requirement. Yes

9. The project must not be a temporary construction project. A temporary construction project is defined as work that must be replaced within five years and is ineligible for funding. The project must also not be staged construction where the project will be replaced as part of future stages. Staged construction is eligible for funding as long as future stages build on, rather than replace, previous work.

Check the box to indicate that the project meets this requirement. Yes

10. The project applicant must send written notification regarding the proposed project to all affected communities and other levels and units of government prior to submitting the application.

Check the box to indicate that the project meets this requirement. Yes

Requirements - Transit and TDM Projects

Transit and TDM Projects Only

1. The project must exclude costs for studies, preliminary engineering, design, or construction engineering (except if the project does not involve construction such as signal re-timing). Noise barriers, drainage projects, fences, landscaping, etc., are not eligible for funding unless included as part of a larger project, which is otherwise eligible. Right-of-way costs are not eligible as a stand-alone proposal, but are eligible when included in a proposal to build or expand transit hubs, transit terminals, park-and-ride facilities, or park-and-pool lots).

Check the box to indicate that the project meets this requirement. Yes

For Transit Expansion Projects Only

2. The project must provide a new or expanded transit facility or service (includes peak, off-peak, express, limited stop service on an existing route, or dial-a-ride).

Check the box to indicate that the project meets this requirement.

3. The applicant must have the capital and operating funds necessary to implement the entire project and commit to continuing the service or facility project beyond the initial funding period.

Check the box to indicate that the project meets this requirement.

4. The project is not eligible for either capital or operating funds if the corresponding capital or operating costs have been funded in a previous solicitation. A previously selected project is not eligible unless it has been withdrawn or sunset prior to the deadline for proposals in this solicitation.

Check the box to indicate that the project meets this requirement.

Other Attachments

File Name	Description	File Size
SmartphoneBasedInterventionsForSustainableTravelBehavior_UMN_2015_BriefSmarTrAC Description.pdf	Brief description of the recently completed SmarTrAC project.	374 KB
SmartphoneBasedInterventionsForSustainableTravelBehavior_UMN_2015_Letter of Endorsement_UMN.pdf	Letter of Institutional Endorsement/Approval from the University of Minnesota	45 KB
SmartphoneBasedInterventionsForSustainableTravelBehavior_UMN_2015_Letter of Support_MetroTransit.pdf	Letter from Metro Transit describing local match and collaboration.	38 KB
SmartphoneBasedInterventionsForSustainableTravelBehavior_UMN_2015_Letter of Support_MnDOT.pdf	Letter of support from MnDOT describing potential interest of MnDOT to expand the project to include state employees in the capitol complex.	239 KB
SmartphoneBasedInterventionsForSustainableTravelBehavior_UMN_2015_Letter of Support_OTC.pdf	Letter of support from the Office for Technology Commercialization at the University of Minnesota describing the potential of future funding (in the form of venture capital) to continue the project work after the initial federal funding.	27 KB
SmartphoneBasedInterventionsForSustainableTravelBehavior_UMN_2015_Letter of Support_PTS.pdf	Letter from Parking and Transportation Services at the University of Minnesota describing collaboration.	30 KB

Measure: Project Location Relative to Jobs, Manufacturing, and Education

Select all that apply:

- Direct connection to or within a Job Concentration Yes
- Direct connection to or within an Educational Institution Yes
- Direct connection to or within a Manufacturing/Distribution Location Yes
- Project provides a direct connection to or within an existing local activity center identified in an adopted county or city plan Yes

City or County Plan Reference

Response (Limit 700 characters; approximately 100 words)

This project will directly impact UMN car commuters and will have regional significance. As one of the largest employers in the region, UMN has more than 15,000 employees who regularly use a car for their daily commute. According to the 2013 Longitudinal Employer-Household Dynamics (LEHD), UMN employees come from cities across the region, including Minneapolis, St. Paul, Plymouth, Blaine, Woodbury, and Edina, to name a few. The attached Regional Economy map indicates the top 25 cities with the largest number of UMN commuters. Many of the Job Concentration Areas, Manufacturing/ Distribution Centers, and Educational Institutions defined in Thrive MSP 2040 are located in these 25 cities.

Upload Map

SmartphoneBasedInterventionsForSustainableTravelBehavior
_UMN_2015_RegionalEconomyMap.pdf

Measure B: Project's Use of Existing Infrastructure

Response (Limit 1,400 characters; approximately 200 words)

By promoting travel mode shifts among UMN car commuters from driving to more sustainable modes, this project will capitalize on a wide range of regional transportation facilities and resources that offer connections between various UMN campus locations and various residential locations of UMN car commuters. Existing transit routes directly serving the UMN campuses include Metro Blue Line; Metro Green Line; Metro Transit Local Routes 2, 3, 6, 7, 16, 22, 61, 87, 111, 113, 114, 115, 118; Metro Transit Express Routes 118, 252, 272; Minnesota Valley Transit Authority Routes 465 and 475; Maple Grove Transit Route 789; and Southwest Transit Route 695. The project will also capitalize on the countless bikeways in the region that connect U of M campus to cities across the region. Other bicycle facilities and resources that are directly connected to this project include the 13 Nice Ride Minnesota bicycle sharing stations on campus (including ten East Bank stations, two West Bank stations, and one St. Paul Campus station), over 6,500 bicycle racks/loops around campuses, and the Campus Bike Center.

Measure A: Total Annual Project Cost per User

Total Project Cost	\$375,000.00
Annual Users	3000
Cost Effectiveness	\$125.00

Description (Limit 1,400 characters; approximately 200 words)

The UMN currently has 15,453 parking contract holders. This project will recruit participants from this pool of car commuters. Participants need to own either an Android phone or an iPhone because the smartphone-based tool will be made available on iOS and Android platforms only. According to the latest smartphone ownership data from GlobalWebIndex and the Pew Research Center, 80% of U.S. internet users and 64% of U.S. adults (including internet users and non-internet users) own a smartphone. Given that UMN is an institution of higher education, it is reasonable to assume that virtually all UMN parking contract holders (primarily employees at the UMN) are internet users. Among smartphone users, 65.6% are Android users and 30.1% are iPhone users. Based upon these statistics, we expect that 76.6% of the UMN parking contract holders either own an Android smartphone or iPhone ($76\% = 80\% * (65.6\% + 30.1\%)$). This gives us a sufficiently large population base ($N=11,830 = 76\% * 15,453$) to achieve a targeted enrollment of 3,000 in the proposed behavior intervention program. Recruiting 3,000 participants from a pool of 11,830 UMN parking contract holders means a participation rate of 25.4%. According to prior transit promotion efforts by the UMN Parking and Transportation Services, a participation rate of 25.4% is a conservative estimate with incentives such as free Go-To-Cards.

Measure A: Project Location and Impact to Disadvantaged Populations

Select all that apply:

- | | |
|--|-----|
| Projects service directly connects to Racially Concentrated Area of Poverty | Yes |
| Projects service directly connects to Concentrated Area of Poverty | Yes |
| Projects service directly connects to census tracts that are above the regional average for population in poverty or population of color | Yes |

Projects service does not directly connect to one of these identified geographic areas listed in 1-3; however, people of color or low-income populations are included in the project service area in lower concentrations, or children, people with disabilities, or the elderly are included in the project service area

The project location includes cities in which UMN employees live. As shown in the attached Socio-Economic map, these cities cover the Racially Concentrated Areas of Poverty defined in the Thrive MSP 2040 and many other areas with above average low-income or minority households. The project will generate direct and large savings in gas, vehicle maintenance, and parking expenses for disadvantaged populations who participate in the behavior intervention program. For each disadvantaged person who participates in the program and shifts their commute modes from driving to transit or other alternative modes for all of their commuting trips, the program is expected to generate annually \$501 cost savings in gas, \$1,080 in parking, and \$2,607 in vehicle maintenance, totaling \$4,188 per participant.

Response (Limit 1,400 characters; approximately 200 words)

The cost savings are estimated based upon the following assumptions and observations:

12.1 miles per one-way commute, according the Twin Cities Travel Behavior Inventory data;

7 one-way commute trips per week per parking contract holder, according to UMN Parking and Transportation Services data;

Average gas mileage of 22 miles per gallon with average gas price of \$2.50 per gallon;

Average UMN parking contract cost of \$90 per month; and

Average vehicle maintenance cost of \$0.592 per mile, according to the American Automobile Association.

Measure B: Affordable Housing

City/Township

Minneapolis
St. Paul
Roseville
Plymouth
Blaine
Brooklyn Park
Woodbury
Woodbury
St. Louis Park
Edina
Shoreview
Eagan
Bloomington
Maple Grove
Minnetonka
Coon Rapids
New Brighton
Falcon Heights
Maplewood
Eden Prairie
Burnsville
Golden Valley
Apple Valley
Columbia Heights
Fridley
Richfield

Affordable Housing Scoring - To Be Completed By Metropolitan Council Staff

City/Township	Score	Number of City
Apple Valley	80.0	1
Blaine	79.0	1
Bloomington	79.0	1
Brooklyn Park	62.0	1
Burnsville	88.0	1
Columbia Heights	67.0	1
Coon Rapids	89.0	1
Eagan	82.0	1
Eden Prairie	75.0	1
Edina	70.0	1
Falcon Heights	60.0	1
Fridley	80.0	1
Golden Valley	75.0	1
Maple Grove	68.0	1
Maplewood	55.0	1
Minneapolis	97.0	1
Minnetonka	68.0	1
New Brighton	62.0	1
Plymouth	61.0	1
Richfield	76.0	1
Roseville	81.0	1
Shoreview	79.0	1
St. Louis Park	77.0	1
St. Paul	98.0	1
Woodbury	78.0	1
	1886	25.00

Affordable Housing Scoring 2 - To Be Completed By Metropolitan Council Staff

Total of Score /Total of Cities

75.44

Measure A: Areas of Traffic Congestion and Reduction in SOV Trips

Given the residential patterns of UMN parking contract holders, the proposed travel behavior intervention project will contribute toward alleviating many of the most congested corridors in the Twin Cities metropolitan region, including I-394, I-35W, I-494, I-694, I-394, I-94, I-35E, TH 62, TH 169, and TH 100. According to MnDOT's Metropolitan Freeway System 2014 Congestion Report, these freeways have some of the worst recurring congestion in the Twin Cities.

Response (Limit 1,400 characters; approximately 200 words)

According to the UMN Parking and Transportation Services data, each parking contract holder on average makes 7 one-way commute trips per week. Travel mode shifts among these parking contract holders from driving to public transit or other alternative modes will reduce roadway congestion in the region, especially during peak commute times (6 am to 9 am and 3pm to 6 pm). By enrolling at least 3,000 participants and assuming half of the participants will shift their commute mode from driving to alternative transportation, this project is expected to reduce up to 10,500 weekly car commute trips (primarily single-occupancy trips) in the region.

Measure B: Emissions Reduction

Number of Daily One-Way Commute Trips Reduced	4200
Average Commute Trip Length	12.1
VMT Reduction	50820.0
CO Reduced	121459.8
NOx Reduced	8131.2
CO _{2e} Reduced	1.8630612E7
PM _{2.5} Reduced	254.1
VOCs Reduced	1524.6

Measure A: Project Innovation

Response (Limit 1,400 characters; approximately 200 words)

Innovative mobility apps have the power to transform the relationship between transportation networks and travelers. The proposed smartphone-based tool is one of these apps. The innovation lies in the augmentation of SmarTrAC (an app developed by the project team for the purpose of travel behavior data collection) with new learning and recommendation capabilities for the purpose of travel behavior intervention. By integrating SmarTrACs data collection capabilities, the new tool will be able to make more effective, personalized recommendations for travel mode shifts. Users tend to be more responsive and have increased awareness and motivation levels when messages describing environmental impacts of driving and personal benefits of sustainable travel behavior are customized based upon their daily travel behavior. Users are also more likely to initiate travel mode shift actions if they are presented with a specific mode shift plan for each of their driving trips. By innovatively integrating data collection with behavior intervention capabilities, the new tool will produce personalized information and action plans that are much more effective than generic information/ suggestions when it comes to making transportation alternatives easier to use and more appealing to car commuters.

Measure B: Project Elements New to Geographic Area or Population

Response (Limit 1,400 characters; approximately 200 words)

The Future of Transportation series produced by CityLab (formerly The Atlantic Cities) has concluded that the smartphone is the most important transportation innovation of the decade. There has been an explosion of mobility apps and interfaces (e.g., RideScout, Google Maps, OMG Transit, RideScout, and Uber) that help people make more informed mode and route decisions. These apps offer functionalities ranging from trip planning and navigation to locating an approaching bus or for-hire vehicle, all of which are not new to the Twin Cities region. Additionally, there is no shortage of health-oriented apps (e.g., Moves and Apple HealthKit) that could promote travel-related physical activity, such as walking and biking. Yet, neither set of apps can effectively and systematically promote travel mode shifts from driving to more sustainable modes they were simply not designed for that purpose. The proposed smartphone app will be new to the region as it targets car commuters, addresses three aspects of travel behavior change (awareness, motivation, and action), and is specifically designed for the purpose of creating successful and lasting mode shift changes. In addition, since data and trip logging are processed in real time on the smartphone in the existing SmarTrAC app, it is an ideal platform for providing customized in-the-moment interventions to users.

Measure B: Organization's Experience and Resources

Response (Limit 1,400 characters; approximately 200 words)

Sponsored by the U.S. Department of Transportation, the project team had successfully developed the SmarTrAC app between Jun 2013 and Feb 2015. SmarTrAC is capable of logging location, speed, and acceleration of the phone, and using that data to infer trip departure/arrival, travel mode, and purpose in real-time. To encourage users to use it fully and continuously, SmarTrAC contains battery-saving algorithms that significantly reduce battery drain rate and an intuitive user interface that solicits active user input in a minimally intrusive way. For more information about the SmarTrAC project success, please contact Carl Chin, Contract Officer, at 617-494-2072 or carl.chin@dot.gov. With prior success on SmarTrAC, the research team is well positioned to deliver this project. Further, the project will draw on the capacity of three UMN departments, including the Humphrey School of Public Affairs, the Center for Transportation Studies, and Parking and Transportation Services. All units have easy access to necessary smartphone programming, dataset creation, word processing, statistical analysis, and spatial analysis expertise and software packages. Secured storage space with nightly back-up is available on the UMN Servers. Computer support staff members are available to help maintain computer equipment, update software, and assist with technical problems.

Measure C: Project Financial Plan

Response (Limit 1,400 characters; approximately 200 words)

The new tool represents an efficient, low-cost, and innovative approach to collecting detailed travel behavior data as well promoting sustainable travel behavior. Although this project targets UMN car commuters, the new tool may be used by any employers who are interested in reducing their businesses carbon footprints. As demonstrated in the attached letter of support from Charles A. Zelle, MnDOT Commissioner, MnDOT is interested in potentially expanding the project to include state employees in the capitol complex. In addition, the new tool is likely to have mass appeal as people are more interested in self-tracking their daily behaviors (i.e., the increasingly popular Quantified Self movement) and as awareness of the importance and benefits of sustainable travel increases. Further, the project uses smartphone technology that is attracting new users each day. The UMN Office for Technology Commercialization (OTC) has filed a utility patent application for the SmarTrAC app and has expressed strong interest in creating a new start-up company around the teams work using venture capital (see the attached letter of support from OTC). The project has a great potential to live on and significantly expand in the years to come.

Transit Projects Not Requiring Construction

If the applicant is completing a transit or TDM application, only Park-and-Ride and other construction projects require completion of the Risk Assessment below. Check the box below if the project does not require the Risk Assessment fields, and do not complete the remainder of the form. These projects will receive full points for the Risk Assessment.

Check Here if Your Transit Project Does Not Require Construction Yes

Measure A: Risk Assessment

1)Project Scope (5 Percent of Points)

Meetings or contacts with stakeholders have occurred

100%

Stakeholders have been identified

40%

Stakeholders have not been identified or contacted

0%

2)Layout or Preliminary Plan (5 Percent of Points)

Layout or Preliminary Plan completed

100%

Layout or Preliminary Plan started

50%

Layout or Preliminary Plan has not been started

0%

Anticipated date or date of completion

3)Environmental Documentation (10 Percent of Points)

EIS

EA

PM

Document Status:

Document approved (include copy of signed cover sheet)

100%

Document submitted to State Aid for review

75%

Document in progress; environmental impacts identified

50%

Document not started

0%

Anticipated date or date of completion/approval

4)Review of Section 106 Historic Resources (15 Percent of Points)

No known potential for archaeological resources, no historic resources known to be eligible for/listed on the National Register of Historic Places located in the project area, and project is not located on an identified historic bridge

100%

Historic/archeological review under way; determination of no historic properties affected or no adverse effect anticipated

80%

Historic/archaeological review under way; determination of adverse effect anticipated

40%

Unknown impacts to historic/archaeological resources

0%

Anticipated date or date of completion of historic/archeological review:

Project is located on an identified historic bridge

5)Review of Section 4f/6f Resources (15 Percent of Points)

(4f is publicly owned parks, recreation areas, historic sites, wildlife or waterfowl refuges; 6f is outdoor recreation lands where Land and Water Conservation Funds were used for planning, acquisition, or development of the property)

No Section 4f/6f resources located in the project area

100%

Project is an independent bikeway/walkway project covered by the bikeway/walkway Negative Declaration statement; letter of support received

100%

Section 4f resources present within the project area, but no known adverse effects

80%

Adverse effects (land conversion) to Section 4f/6f resources likely

30%

Unknown impacts to Section 4f/6f resources in the project area

0%

6)Right-of-Way (15 Percent of Points)

Right-of-way or easements not required

100%

Right-of-way or easements has/have been acquired

100%

Right-of-way or easements required, offers made

75%

Right-of-way or easements required, appraisals made

50%

Right-of-way or easements required, parcels identified

25%

Right-of-way or easements required, parcels not identified

0%

Right-of-way or easements identification has not been completed

0%

Anticipated date or date of acquisition

7)Railroad Involvement (25 Percent of Points)

No railroad involvement on project

100%

Railroad Right-of-Way Agreement is executed (include signature page)

100%

Railroad Right-of-Way Agreement required; Agreement has been initiated

60%

Railroad Right-of-Way Agreement required; negotiations have begun

40%

Railroad Right-of-Way Agreement required; negotiations not begun

0%

Anticipated date or date of executed Agreement

8)Construction Documents/Plan (10 Percent of Points)

Construction plans completed/approved (include signed title sheet)

100%

Construction plans submitted to State Aid for review

75%

Construction plans in progress; at least 30% completion

50%

Construction plans have not been started

0%

Anticipated date or date of completion

9)Letting

Anticipated Letting Date

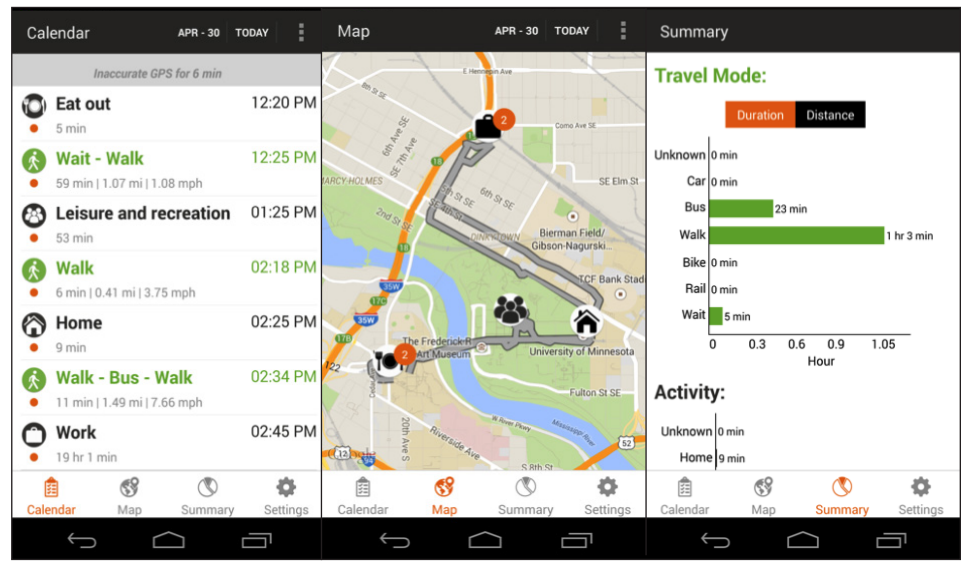
CTS Project Brief

SmarTrAC

A Smartphone Solution for Context-Aware Travel & Activity Capturing

Key Features

- SmarTrAC—a user-friendly, open-source Android smartphone application for collecting travel behavior data—yields travel data of a breadth and depth not available by using either smartphone sensory data or traditional travel diary methods alone.
- SmarTrAC effectively combines smartphone sensing with advanced statistical and machine learning techniques.
- SmarTrAC obtains data from two sources: sensors and users. The data obtained from these two sources inform, calibrate, and augment each other. Over time, this feedback loop improves SmarTrAC's sensor data processing as well as the procedures for capturing user input.
- Field tests show that SmarTrAC has a reasonable battery consumption rate, moderate data storage and transmission requirements, high accuracy in identifying activity versus trip episodes and in classifying the travel modes of each trip, and medium-high accuracy in classifying the trip purpose.



A team at the University of Minnesota has created an innovative smartphone application known as SmarTrAC. The app provides an efficient, low-cost approach for collecting and processing detailed, multimodal, and multidimensional travel data.

Why SmarTrAC?

The use of smartphones to collect travel behavior data has increased rapidly in recent years. The greater availability of this travel behavior data is good news for the government agencies and transportation planners that rely on data to make informed decisions about transportation and programming needs and to maximize the limited dollars available for transportation investment.

Existing smartphone-based tools have generally used the smartphone's automatic sensing functionality to detect travel mode and to collect position and route data. While this is important information, travel behavior has many other key dimensions, such as trip purpose, travel experience, and travel companionship—all of which are critical for understanding people's travel choices.

In contrast, traditional travel diary methods and some first-generation smartphone-based travel survey tools enable the collection of this multidimensional travel data, but these methods are often burdensome to study subjects and impractical for use in a diverse, mobile, and increasingly time-stressed population.

SmarTrAC offers the best of both worlds: It addresses the limitations of both passive sensing and user recall surveys to enable context-aware travel and activity capturing. And unlike other existing apps, SmarTrAC hosts sensor data and user input data in a single device and enables interaction between the two data sources, which in turn allows for data calibration and processing refinements over time.

About SmarTrAC

SmarTrAC has two major functionalities:

- It capitalizes on the smartphone's computing capability by combining smartphone sensing with advanced statistical and machine learning techniques to automatically detect, identify, and summarize attributes of daily activity and travel episodes.
- It leverages the smartphone's communication capability to incorporate survey techniques that allow users to view and provide additional information on the automatically identified activity and travel episodes at their convenience on a daily basis.

SmarTrAC enables sensor data to interact with user input data so that the two data sources can inform, calibrate, and augment each other:

- Sensor data are analyzed and processed locally on the phone in real time to extract meaningful activity and travel information. The extracted information reduces the respondent's burden and serves as an initial information basis to probe for more detailed and more accurate information from the user.
- The probed user input data in turn optimize how sensor data are analyzed and processed. This increases the accuracy of the information extracted from sensor data over time.
- The interaction between sensor data and user input data perfects the sensor data processing procedure and the process of capturing user input in SmarTrAC over time.

Performance Test Results

The project team ran a series of laboratory tests and two rounds of seven-day field tests with 17 Android phone users. The tests show that the app has:

- **Reasonable battery consumption rate.** With SmarTrAC running continuously, 74% of the phones had a battery life longer than six hours, and about half the phones had a battery life longer than eight hours.
- **Moderate data storage and transmission requirements.** SmarTrAC produces 50 megabytes (uncompressed) of data per day; the associated weekly data transfer needs are roughly 150 megabytes after data compression.
- **Good accuracy.** SmarTrAC had high accuracy in identifying activity versus trip episodes (90%) and in classifying the travel modes of each trip episode (86%), and medium-high accuracy in classifying the types of activity episodes (user-specified activity type is among the top two most probable predicted activity types 70-80% of the time).

SmarTrAC Benefits

SmarTrAC benefits include:

- **Minimizing the respondent burden.** Compared to traditional travel survey methods, SmarTrAC has a much lower respondent burden because it allows automatic data collection on activity and trip attributes such as trip activity, trip duration, travel mode, and trip purpose. In addition, it does not require respondents to carry or use any additional devices or instruments if they already own a smartphone.
- **Gathering comprehensive data.** By taking a "best of both worlds" approach, SmarTrAC captures many more dimensions of travel behavior data than either travel surveys or GPS tracking alone.
- **Producing accurate data.** SmarTrAC provides advantages over other technologies by enabling sensor data to interact with user input data so that the two data sources can augment each other. In this way, SmarTrAC minimizes recall bias or reporting errors in user input data—the user is able to access information derived from sensor data when providing input.
- **Simplifying distribution and management.** SmarTrAC is easier to distribute and manage than other technologies because it does not involve providing additional devices or instruments to respondents if they already own a smartphone. Users will only need to download the SmarTrAC app and install it on their phone, and updates can be provided to users quickly and easily. In addition, SmarTrAC collects data in a way that reduces the need for post-processing.

Future Directions

Possible future improvements include battery-saving techniques, reduced data storage requirements, predictive accuracy improvements, integration with additional geographic data and knowledge bases, enhanced data privacy and security features, enhanced visualization and analytical tools, development of a web interface, and development of a SmarTrAC app for Apple devices.

About the Project

SmarTrAC was developed by Associate Professor Yingling Fan, Assistant Professor Julian Wolfson, Professor Gediminas Adomavicius, and computer science students Yash Khandelwal and Jie Kang, under contract with the Volpe Center at the U.S. Department of Transportation in support of the Intelligent Transportation Systems Joint Program Office. Details are in the final report—*SmarTrAC: A Smartphone Solution for Context-Aware Travel and Activity Capturing*.

UNIVERSITY OF MINNESOTA

Twin Cities Campus
September 10, 2015

Sponsored Projects Administration

450 McNamara Alumni Center
200 Oak Street S.E.
Minneapolis, MN 55455
Office: 612-624-5599
Fax: 612-624-4843

Metropolitan Council

RE: 01976 – 2015 Travel Demand Management (TDM) – Final Application
*Project Entitled: Smartphone – Based Interventions for Sustainable
Travel Behavior*

UM PI: Yingling Fan

DUNS Number: 55 591 7996 / EIN: 416607513

Dear Sir or Madam:

A proposal for the above referenced project is hereby submitted on behalf Yingling Fan, Associate Professor, Urban and Regional Planning, Hubert H Humphrey School of Public Affairs, for the period April 1 2016 through March 31, 2018 in the amount of \$300,000.

This proposal has been administratively approved on behalf of the Regents of the University of Minnesota. Questions concerning programmatic aspects of the project should be directed to the Principal Investigator(s). Those having to do with contract and budgetary matters should be directed to Pat Jondahl at 612-626-2244 in the Office of Sponsored Projects Administration.

Sincerely,



Judith Krzyzek, Associate Director
Sponsored Projects Administration

Enclosures

cc: Yingling Fan, Principal Investigator, HHH School of Public Affairs
Elaine Pioske, Grants Coordinator, HHH School of Public Affairs



Regional Solicitation: Travel Demand Management
Metropolitan Council
390 North Robert Street
St. Paul, Minnesota 55101
Attn: Elaine Koutsoukos, TAB Coordinator

Re: Smartphone-Based Interventions for Sustainable Travel Behavior

August 31, 2015

Dear Project Selection Recommendation Committee,

Metro Transit supports the above-referenced proposal from the University of Minnesota to develop a smartphone-based behavior intervention tool for promoting modal shifts from driving to taking transit or non-motorized modes. The project team will implement intervention programs with the tool to target University of Minnesota parking contract holders and, ultimately, reduce congestion and promote a multimodal network in the Twin Cities.

We are extremely supportive of technological innovation as a strategy to support the adoption and use of alternative modes. In addition to this project's intervention programs, the SmarTrAC application's ability to collect data on user's route and trip length will provide a useful foundation for future work. The information gathered by SmarTrAC will help identify data that can assist with the development of multimodal trip planning. Specifically, the data collection method used by this application will be a valuable resource for Metro Transit's Mobility Ecosystem Coordinator, who will manage regional multimodal partnerships and work toward the development of a Multi Modal Ecosystem.

Metro Transit will provide a total of \$75,000 in local match for this project. As a part of this match, our staff will provide \$20 Go-To Cards at discounted rates, which have been proven to be effective in attracting new riders during Green Line promotion effects, as incentives to recruit SmarTrAC-Intervene participants. Additional cash values will be available on certain distributed Go-To-Cards conditional on the participant meeting a minimum number of modal shift trips. We look forward to working with the University of Minnesota on this project and promoting transit and non-motorized modes of travel.

Regards,

A handwritten signature in cursive script that reads 'Theresa E Cain'.

Theresa Cain
Manager, Commuter Programs
Metro Transit
560 6th Ave. N
Minneapolis, Minnesota 55411
612-349-7538

A service of the Metropolitan Council



Minnesota Department of Transportation

Transportation Building
395 John Ireland Boulevard
Saint Paul, MN 55155

Date: September 1, 2015

Elaine Koutsoukos
TAB Coordinator
Metropolitan Council
390 North Robert Street
Saint Paul, MN 55101

RE: Smartphone-Based Interventions for Sustainable Travel Behavior

Dear Project Selection Recommendation Committee:

The Minnesota Department of Transportation supports the above-referenced proposal from the University of Minnesota to develop a smartphone-based behavior intervention tool for promoting modal shifts from driving to taking transit or non-motorized modes. The project team will implement intervention programs with the tool to target parking contract holders at the University of Minnesota and, ultimately, reduce congestion and promote alternative modes in the Twin Cities. In fact, we are interested in potentially expanding the scope to include state employees in the capitol complex.

The Department's vision is to provide a multimodal transportation system that maximizes the health of people, the environment and our economy. The proposed application's strategy to support behavioral change action toward alternative modes in the Twin Cities region through technological innovation will support the vision and our Statewide Multimodal Transportation Plan, thereby poising the transportation industry for future success.

We look forward to learning more about this project from the University of Minnesota as it progresses.

Sincerely,

A handwritten signature in blue ink, appearing to read "Charles A. Zelle".

Charles A. Zelle
Commissioner

An Equal Opportunity Employer



Regional Solicitation: Travel Demand Management
Metropolitan Council
390 North Robert Street
St. Paul, Minnesota 55101
Attn: Elaine Koutsoukos, TAB Coordinator

Re: Smartphone-Based Interventions for Sustainable Travel Behavior

September 4, 2015

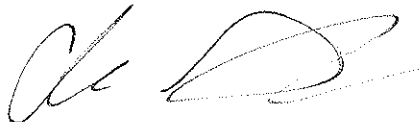
Dear Project Selection Recommendation Committee,

The Office for Technology Commercialization at the University of Minnesota supports the above-referenced proposal from the University of Minnesota to develop a smartphone-based behavior intervention tool for promoting modal shifts from driving to taking transit or non-motorized modes. The project team's development of this innovative smartphone tool will lay the groundwork for future expansion and implementation.

We strongly believe that the SmarTrAC application will continue to develop and expand after this project. This technology is highly commercializable and, as such, we have filed a utility patent application, are maintaining copyrights and trademarks for the SmarTrAC technology. Following this project, we are planning to launch a start-up company based on SmarTrAC with the future support of venture capital.

The Office for Technology Commercialization strongly supports technological innovations for real-world issues and problems. The SmarTrAC application's goals to reduce traffic congestion, promote alternative modes of travel, and positively impacting air quality in the Twin Cities exemplify this belief. We look forward to learning about this project as it progresses and finding more ways to share and advance the SmarTrAC application in the future.

Regards,

A handwritten signature in black ink, appearing to read 'Chris Ghere', with a stylized flourish extending to the right.

Chris Ghere
Technology Strategy Manager
Office for Technology Commercialization
University of Minnesota
200 Oak Street SE
Minneapolis, Minnesota 55455
612-624-6797

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Parking and Transportation Services

*300 Transportation and Safety Bldg.
511 Washington Avenue S.E.
Minneapolis, MN 55455*

*Office: 612-626-7275
Fax: 612-624-8899
www.pts.umn.edu
Email: parking@umn.edu*

Regional Solicitation: Travel Demand Management
Metropolitan Council
390 North Robert Street
St. Paul, Minnesota 55101
Attn: Elaine Koutsoukos, TAB Coordinator

Re: Smartphone-Based Interventions for Sustainable Travel Behavior

September 8, 2015

Dear Project Selection Recommendation Committee,

Parking and Transportation Services (PTS) at the University of Minnesota supports the above-referenced proposal from the University of Minnesota to develop a smartphone-based behavior intervention tool for promoting modal shifts from driving to taking transit or non-motorized modes. The project team will use the tool to implement intervention programs targeting University of Minnesota parking contract holders for successful and lasting travel behavior changes, which will lead to significant congestion mitigation in the Twin Cities region.

PTS is very supportive of the project's efforts to reduce congestion in the Twin Cities region as a whole, and, particularly, in the areas around the University of Minnesota. This project, and its long-lasting positive benefits, will affect commuters traveling from a wide variety of communities in the Twin Cities. In addition to congestion mitigation, this work will have air quality impacts for the Twin Cities region, as well.

Our staff will work with Metro Transit and the project team to recruit car commuters from a population of 15,453 University of Minnesota parking contract holders to use the tool and promote travel behavior changes. PTS is looking forward to working with the project team on this important effort and promoting alternative modes of travel in the Twin Cities.

Sincerely,



Ross Allanson, Director
Parking and Transportation Services
300 Transportation and Safety Building
511 Washington Ave. SE
Minneapolis, Minnesota 55455
612-626-7275

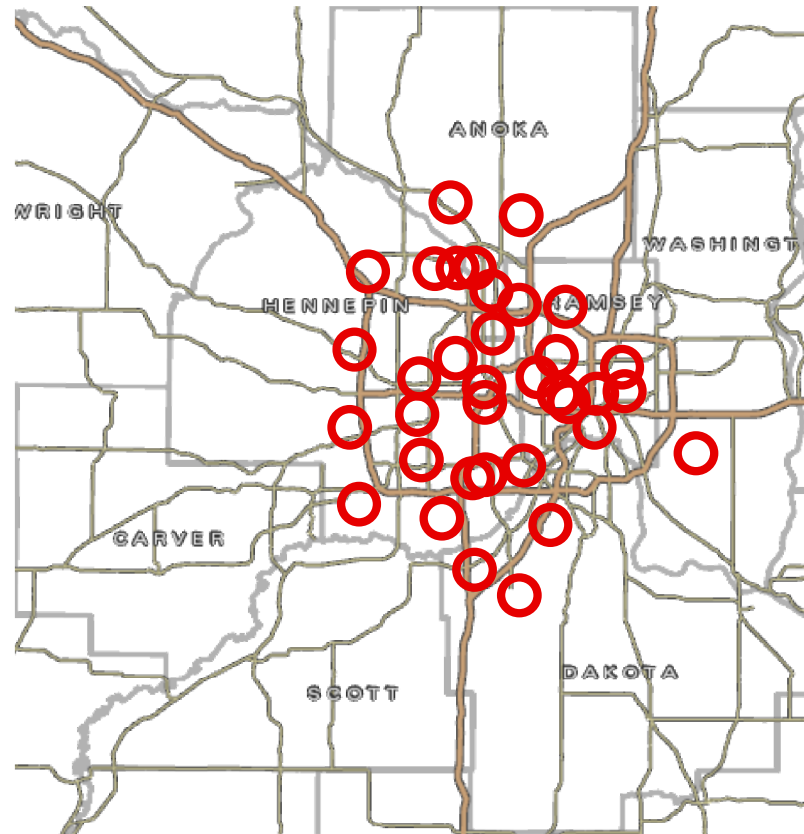
Driven to DiscoverSM

Results

Project **IN** area of Job Concentration.

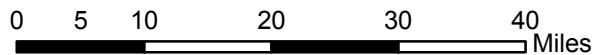
Project **IN** area of Manufacturing and Distribution.

Project **CONNECTED** to area of Education Institutions.



NCompass Technologies

 Project Points



Created: 8/25/2015
LandscapeRSA5

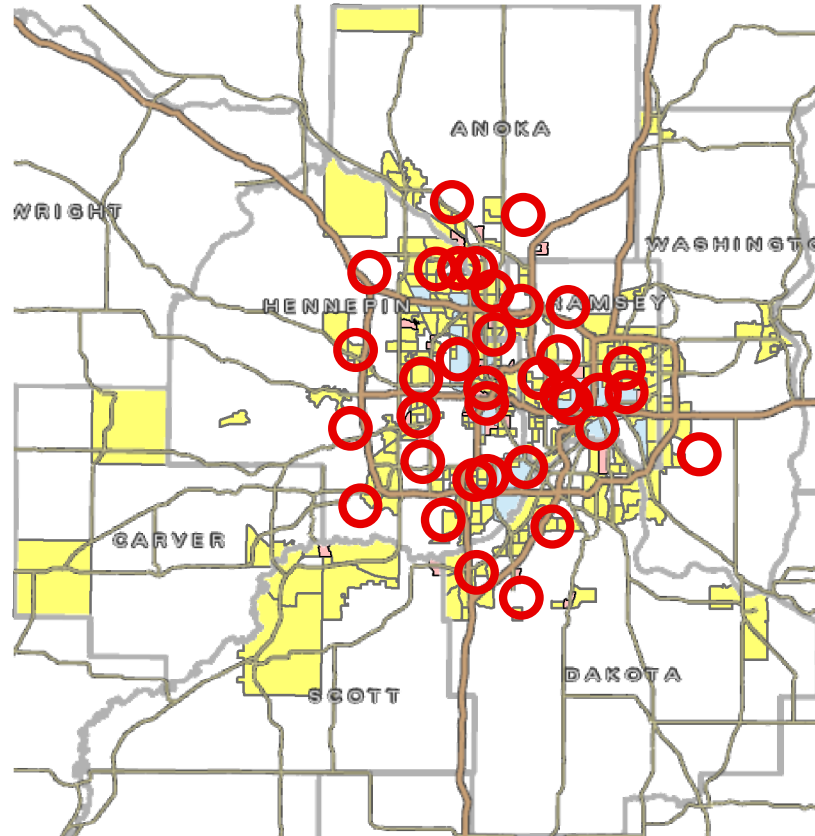


For complete disclaimer of accuracy, please visit
<http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>







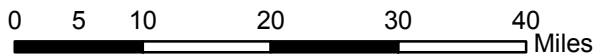
Results

Project **IN** a racially concentrated area of poverty.



NCompass Technologies

-  Project Points
-  Area of Concentrated Poverty > 50% residents of color
-  Area of Concentrated Poverty
-  Above reg'l avg conc of race/poverty



Created: 8/25/2015
LandscapeRSA2



For complete disclaimer of accuracy, please visit
<http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>



University of Minnesota/Humphrey School of Public Affairs

Project Title: Travel Demand Management

DETAILED BUDGET FOR YEAR 1		Duration months			
		Est Start Date	4/1/2016	Est End Date	5/31/2017
PERSONNEL (APPLICATE ORGANIZATION ONLY)		DOLLAR AMOUNT			
NAME/ROLE	PERCENT EFFORT ON PROJECT	DOLLAR AMOUNT			
		SALARY/WAGE COST	FRINGE BENEFITS	TOTALS	
Yingling Fan - 4 weeks during summer PI/Project Lead	8%	\$ 11,460	\$ 3,862	\$ 15,321	
Julian Wolfson Co-Investigator	5%	\$ 5,431	\$ 1,830	\$ 7,261	
Gedas Adomavicius Co-Investigator	2%	\$ 4,248	\$ 1,432	\$ 5,680	
To Be Named Grad Research Assistant (Comp Sci) AY 2017	50%	\$ 19,052	\$ 17,768	\$ 36,820	
To Be Named Grad Research Assistant (Comp Sci) SUM	50%	\$ 6,315	\$ 1,111	\$ 7,426	
To Be Named PhD Grad Research Assistant (HHH) AY 2017	50%	\$ 15,902	\$ 17,213	\$ 33,115	
To Be Named PhD Grad Research Assistant (HHH) SUM	50%	\$ 5,271	\$ 928	\$ 6,199	
SUBTOTALS		\$ 67,679	\$ 44,144	\$ 111,822	
SUBCONSULTANT/SUBCONTRACTOR COSTS (DESCRIBE AND ITEMIZE)		\$ -			
EQUIPMENT (DESCRIBE AND ITEMIZE)					
SUPPLIES (DESCRIBE AND ITEMIZE)					
TRAVEL (DESCRIBE AND ITEMIZE)					
OTHER EXPENSES (DESCRIBE AND ITEMIZE)		\$ 96,002			
Computer Science - Comp and Networking Fee \$2.756 per hour worked.	1040	\$ 2,866			
Center for Transportation Studies Website Development		\$ 6,000			
User and business recruitment materials		\$ 5,000			
Program Administration		\$ 6,400			
Software		\$ 736			
\$20 Go-To Cards	no = 3750	\$ 75,000			
TOTAL PROJECT DIRECT COSTS		\$ 207,824			
TOTAL PROJECT F & A (indirect) COSTS		52% MTDC	\$ 97,843	\$ 50,879	
TOTAL PROJECT COSTS		\$ 258,703			

Federal	Local Match Metro Transit	Local Match HHH
\$ 15,321		
\$ 7,261		
\$ 5,680		
\$ 36,820		
\$ 7,426		
\$ 33,115		
\$ 6,199		
\$ 111,822		
\$ 21,002	\$ 75,000	\$ -
\$ 132,824	\$ 75,000	\$ -
\$ 50,879	0	0
\$ 183,703	\$ 75,000	\$ -

DETAILED BUDGET FOR YEAR 2		Duration months						
		Est Start Date	4/1/2017	Est End Date	5/31/2018			
PERSONNEL (APPLICATE ORGANIZATION ONLY)		PERCENT EFFORT ON PROJECT		DOLLAR AMOUNT				
NAME/ROLE			SALARY/WAGE COST	FRINGE BENEFITS	TOTALS	Federal	Local Match Metro Transit	Local Match HHH
Yingling Fan - Cost share 10% during AY PI/Project Lead	10%	\$ 11,452	\$ 3,859	\$ 15,312				\$ 15,312
Julian Wolfson Co-Investigator	0%	\$ -	\$ -	\$ -				
Gedas Adomavicius Co-Investigator	0%	\$ -	\$ -	\$ -				
To Be Named Grad Research Assistant (Comp Sci) AY 2017	50%	\$ 19,528	\$ 17,851	\$ 37,380	\$ 37,380			
To Be Named Grad Research Assistant (Comp Sci) SUM	50%	\$ 6,473	\$ 1,139	\$ 7,612	\$ 7,612			
To Be Named PhD Grad Research Assistant (HHH) AY 2017	50%	\$ 16,300	\$ 17,283	\$ 33,583	\$ 33,583			
To Be Named PhD Grad Research Assistant (HHH) SUM	50%	\$ 5,403	\$ 951	\$ 6,353	\$ 6,353			
SUBTOTALS			\$ 59,156	\$ 41,084	\$ 100,240	\$ 84,928	0	\$ 15,312
SUBCONSULTANT/SUBCONTRACTOR COSTS (DESCRIBE AND ITEMIZE)					\$ -			
EQUIPMENT (DESCRIBE AND ITEMIZE)								
SUPPLIES (DESCRIBE AND ITEMIZE)								
TRAVEL (DESCRIBE AND ITEMIZE)								
OTHER EXPENSES (DESCRIBE AND ITEMIZE)					\$ 3,603	\$ 3,603		
Computer Science - Comp and Networking Fee \$2.756 per hour worked.	1040	\$ 2,866						
Software		\$ 737						
TOTAL PROJECT DIRECT COSTS					\$ 103,843	\$ 88,531	\$ -	\$ 15,312
TOTAL PROJECT F & A (indirect) COSTS		52% MTDC	\$ 53,397	\$ 27,766	\$ 27,766		0	0
TOTAL PROJECT COSTS					\$ 131,609	\$ 116,297	\$ -	\$ 15,312

Budget Summary - Fed Portion	YEAR 1	YEAR 2	TOTAL
Personnel	\$ 111,822	\$ 84,928	\$ 196,750
Other Expenses	\$ 21,002	\$ 3,603	\$ 24,605
Total Direct Costs	\$ 132,824	\$ 88,531	\$ 221,355
Total Indirect Costs	\$ 50,879	\$ 27,766	\$ 78,645
TOTAL DIRECT AND INDIRECT	\$ 183,703	\$ 116,297	\$ 300,000

77%

Budget Summary - Cost Share	YEAR 1	YEAR 2	TOTAL
Personnel	\$ -	\$ 15,312	\$ 15,312
Other Expenses	\$ 75,000	\$ -	\$ 75,000
Total Direct Costs	\$ 75,000	\$ 15,312	\$ 90,312
Total Indirect Costs	\$ -	\$ -	\$ -
TOTAL DIRECT AND INDIRECT	\$ 75,000	\$ 15,312	\$ 90,312

23% 20% on total project costs
match minimum requirement