SHRP2 Implementation Assistance Program

Round 4 Application Form - *Application period closes **June 27, 2014***.

Advanced Travel Analysis Tools for Integrated Travel Demand Modeling Bundle Partnership to Develop an Integrated, Advanced Travel Demand Model and a Fine-Grained, Time-Sensitive Network (C10)

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This SHRP2 Solution is part of Round 4 of the Implementation Assistance Program. For more information about this product or about applying for implementation assistance, visit the Implementation Assistance Program page (http://www.fhwa.dot.gov/GoSHRP2/ImplementationAssistance) or this product's application page (where this form originated) on the GoSHRP2 website.

Point of Contact:

The SHRP2 Implementation Assistance Program is designed to foster peer learning, and as a result, applicants are encouraged to share their experience implementing SHRP2 products with others. By submitting this application, your organization grants permission to FHWA to publish and distribute the name and business email address of a **staff member from the applying organization** who is familiar with the project. Please provide:

POC Name: David Ory.

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Questions:

1. Describe your organization's interest in and goals for adopting these products and methods. (What do you hope to gain? How do you define success?)

   The Metropolitan Transportation Commission (MTC), San Francisco County Transportation Authority (SFCTA), and Puget Sound Regional Council (PSRC), the "Agency Partners", are interested in representing transit accessibility and passenger behavior at a fine grained level within their respective activity-based travel demand models in order to better evaluate the myriad transit-related projects in the Bay Area and Puget Sound regions. Specifically, transit reliability has been repeatedly cited as one of the largest contributing factors to perceived accessibility; transit capacity has been one of the largest stakeholder concerns as both regions have adopted aggressive land use targets in dense, urban areas; and the equity of transit investment and service has been the source of frequent debate among policymakers.

   The Agency Partners seek to develop and implement a disaggregate, person-based transit accessibility and assignment tool to be used within their activity-based travel

demand model that is capable of representing issues of transit capacity, reliability, and passenger heterogeneity. Such a tool could be naturally and easily extended as a standalone operational analysis planning tool. The desired outcome is the use of such a tool to objectively develop and evaluate transit system expansion and maintenance plans as well as compare the relative merits and costs of such transit investments within the context of long range transportation planning. Both the Bay Area and Puget Sound regions anticipate that such a tool would aid in decisions related to forthcoming regional transit state of good repair and expansion (including for core capacity) planning exercises.

Specific deliverables include:
- Production-ready calibrated and validated dynamic transit network model for the Bay Area integrated with SF-CHAMP and tested with preliminary versions Travel Model Two.
- Functional dynamic transit network model for the Puget Sound region with several rounds of calibration and validation completed and functional integration of SoundCast completed.
- Estimation of a transit route choice model using observed route data.
- Improved software code and development environment for dynamic transit network model software including documentation, improved development environment, and development of a developer and user community.
- Communications and outreach to both technical and consumer audiences. This includes maintaining an online collaboration community, writing technical- and consumer-oriented papers.
- Developing technical capacity in the field at both the university- and agency- level through teaching material development with a professor/graduate-student partner, solicitation of interested other agencies and giving the travel stipends to see what we are working on, and the training and utilization of multiple interns as the core worker in order to broaden the workforce beyond the current usual suspects.
- Development and refinement of open source tools for wrangling and maintaining data banks of transit data.
- Test cases where we have before/after data in order to dynamically validate the model.
- Technical review of our work from experts in multiple functional areas.

2. What specific question (local issue of interest) do you plan to address with this tool?

   Both the Bay Area and Puget Sound regions will be undertaking transit system expansion (including for core capacity) planning exercises within the next two to three years.

   In the Bay Area's current regional transportation plan, over 80 percent of expected revenues are targeted for state of good repair investments. Of the state of good repair expenses, the majority are targeted for public transit. Our current analytical tools do not allow us to quantify the benefit of state of good repair investments relative to capital investments in new infrastructure. Further, the Bay Area's economy is driven in no small part by the amenity and attractiveness of downtown San Francisco. This vibrancy, in turn, depends in no small part on a public transportation system that efficiently delivers

hundreds of thousands of commuters each day -- commuters for whom reliability and comfort are very important. The reliability and comfort of the Bay Area's transportation system and our ability to accurately represent traveler responses to changes in reliability and comfort are therefore critically important to our mission of efficiently and wisely programming hundreds of millions of public dollars.

The Puget Sound region has extensive, voter-approved light rail and commuter rail expansion set for completion in 2023. The region's transit agencies have begun, for the first time, to perform long range operational planning for system improvements other than major infrastructure investments. Substantive future year transit network changes have never been included in modeling except for the rail systems and blunt assumptions about headway increases. For the first time ever, PSRC and the transit agencies intend to collaborate to plan for a more integrated future system. Applying a dynamic transit network model would assist this new, important planning process to build a more robust transit system with more integrated service.

3. Describe your approach to using the product or products:
   a. What ABM or dynamic network modeling tools will be used?
   b. How will time-dependent highway or transit routing be considered?
   c. To what extent will dynamic network modeling tools be used in a large area?

   a. This project will focus on the development of a person-based dynamic transit network model for two regions to be used with activity-based travel demand models that already exist at all three partner agencies. MTC used their CT-RAMP activity-based travel demand model, Travel Model One, for their last regional transportation plan, Plan Bay Area (adopted in July 2013). PSRC is in the final stages of testing it's SoundCast activity-based travel demand model. San Francisco County has been continuously using, maintaining, and improving the SF-CHAMP activity-based travel demand for well over a decade. In addition, SFCTA has a calibrated, city-wide DTA model and has successfully tested the FAST-TrIPs dynamic transit model in San Francisco. All three Agency Partners currently have functioning Activity-Based Travel Demand models and are in the process of jointly developing activity-based travel demand modeling software as part of a five-member consortium facilitated by AMPO.

   Based on the successful test of the FAST-TrIPs dynamic transit model in San Francisco, it is anticipated that it will be used as a foundation for this project. However the Agency Partners will conduct a review of available resources to select a dynamic transit network model to make sure that whatever is selected will meet the needs of the respective agencies.

   b. Time dependent transit routing is at the foundation of FAST-TrIPs and is a necessary improvement over large time periods in order to meaningfully capture the effects of crowding, reliability, and bus bunching. This project aims to incorporate time-dependent

transit routing into the transit network component of existing activity-based travel models at the respective partner agencies.

c. After the successful test of FAST-TrIPS in San Francisco, the Agency Partners aim to develop the dynamic transit network model across the Puget Sound and Bay Area regions. However, it is likely that small test networks will continue to be used throughout the development process for debugging and optimization exercises.

4. Describe the data that you will need for this implementation, and where it will come from.

There are five components to the data needs: (1) transit supply, (2) transit demand, (3) transit rider behavior (path choice), (4) transit system performance, and (5) observed demand data.

1. Transit supply consists of the transit network itself (rolling stock, guideways, ferry routes, and roadways) as well as how that network is accessed (to and from activity locations).

Dynamic transit network models represent supply as a series of individual transit routes, each with a vehicle type and schedule of departure times. This differs from most aggregate transit network models, which generally assume a constant headway for a time period lasting one to several hours. The vast majority of the transit lines in both the Puget Sound and Bay Area belong to agencies who publish schedules via the General Transit Feed Specification (GTFS). In cases where the GTFS data is not available, schedules can be simulated. The one potential area of major data development in this category is either the adoption of an all-streets network to support the detailed GTFS stop locations, an aggregation of transit stops in areas where an all-streets network is not developed, or simply mapping the schedules from GTFS to the transit lines that are already geographically coded at a level consistent with the roadway network in the current activity-based travel models. PSRC has begun transit data improvement by using the GTFS to build its 2014 transit network, which will be completed in Summer 2014; MTC is embarking on a similar effort that is also expected to be complete Summer 2014. In all cases, it is not anticipated that route and schedule data should be difficult to obtain and maintain in either region although we do want to develop sustainable processes by which we can maintain and develop the networks into the future.

Access links connect the transit network supply to activity locations. Access links will need to be dynamically created and, in unique cases, statically coded in order to represent the connections between a TAZ and the transit stop. In their initial FAST-TrIPs implementation, San Francisco was able to use the access links created from their planning model which included real-network distances and a perceived generalized cost that was empirically estimated and includes factors like having to walk up-hill and density.

2. In the final model framework, the activity-based travel demand model will be used as the demand component to thy dynamic network model. However, within the context of

refining the network model, it may be necessary to adjust the output of the activity-based travel model to more accurately represent transit demand. If necessary, this will be done using techniques outlined in several publications by Mark Hickman using fare card, Automatic Passenger Counter, and on-board survey data discussed below.

3. One of the potential areas of significant advancement with this project is the potential to use revealed route choice data to estimate a route choice model for various user classes. The Agency Partners have access to route choice data from a variety of sources including:

a. the California Household Travel Survey, which has a hundreds of samples of GPS transit routes in the Bay Area;

b. on board travel surveys, which are available in both regions for both major and smaller transit providers. The last SFMTA on-board survey was about 10 years ago and the SFMTA, MTC, and SFCTA are working to find funding to update it in Spring 2015. The last BART on-board survey was in 2008 and MTC and BART are preparing for another survey in Fall 2014. AC Transit was surveyed in Fall 2012 and Caltrain will be surveyed in Fall 2014.

c. the SFCTA anticipates having access to smartphone-based data collected by Andre Carrell and Joan Walker at the University of California at Berkeley using the X-Lab mobile app as part of the Travel Quality and Choices Study. This data combines geographic data from WiFi triangulation and real-time AVL data to identify revealed route choices.

Having a rich source of route choice data will allow us to robustly incorporate the factors affecting transit route choice and route choice heterogeneity into the network algorithm. In this way, we can have heterogeneous weightings towards various factors such as time, seat availability, walking distance and reliability.

d. PSRC Spring 2015 GPS household survey data. PSRC has just completed a Spring 2014 household travel survey that will provide a rich new data source. As a follow-up in Spring 2015, some population will be surveyed via GPS. The GPS survey has not yet been designed but if given assistance from this project, we may be able to put its focus largely on transit users. The exact use of the data is not clear, so it will be possible to take this opportunity to explore transit route choice.

4. Data needed for transit system performance relates characteristics about travel demand and network characteristics with how well the system performs in terms of reliability, crowding, and travel time. This includes estimating dwell time as a function of boarding policy (i.e. payment type), vehicle type, platform type, and passenger activity. Dwell time can be estimated from Automatic Passenger Counter (APC) Data. Reliability and travel time will be an emergent property of the dynamic transit network simulation, but can be validated using Automatic Vehicle Location (AVL) and APC data. APC and AVL data is available for SFMTA, AC Transit and VTA in the Bay Area. In the Puget

Sound region, it is available for most of the transit agencies, including King County Metro and Sound Transit. For large providers that do not have APC or AVL data, reasonable assumptions or limited data collection may be required.

5. Finally, the observed passenger activity data such as APC, fare card, and regular manual counts will be used to validate demand estimates. All major agencies that do not have APC data do have fare card or manual count data readily available including BART, Caltrain, Golden Gate Transit, SamTrans, and Bay Area Ferries.

Greg Erhardt, a researcher at the University College of London supported by the SFCTA, has been developing open-source data processing techniques for both AVL and APC data from SFMTA to cut down on processing time that can be associated with this rich data source (https://github.com/UCL/sfdata_wrangler). The Agency Partners anticipate expanding upon these techniques and developing tools to refine not just SFMTA data, but clean and combine data available across the region to provide a robust picture of transit travel across the region. Getting a robust picture of transit travel not just for a single data point, but on an ongoing basis will be a key factor in the sustainability of the dynamic transit network model, and mandatory for being able to validate the model sensitivities.

5. What is your agency's past experience with activity-based modeling, dynamic traffic assignment and traffic simulation?

MTC has experience in developing and using its activity-based travel demand model, Travel Model One, for one regional transportation plan (Play Bay Area, July 2013). MTC anticipates completing a beta version of their next generation travel model, Travel Model Two, by December 2014. Travel Model Two will use a complete streets network and an ~40,000 zone (similar to blocks) spatial system. SFCTA has been maintaining and continuously improving its activity-based travel demand model, SF-CHAMP for over a decade. In addition, SFCTA has been developing, maintaining, and using a DTA model since 2009 and successfully experimented with the FAST-TrIPs dynamic transit model in 2012. PSRC is in the final pushes of releasing their Daysim-based activity-based travel demand model, SoundCast, but has staff that have significant experience with an operational activity-based travel demand model.

6. What partnerships, if any, are planned with other agencies, and what expertise will they bring?

One of the strengths of this proposal is the partnership between MTC, PSRC, and SFCTA. All three agencies have worked together before, including a current partnership to develop an open-source activity-based modeling software platform. SFCTA brings a wealth of experience in the nuts of bolts of implementing and maintaining a dynamic network model and has experience implementing a proof of concept dynamic network model (FAST-TrIPs) in San Francisco. Before coming to PSRC, Billy Charlton led the development of DTA for the San Francisco Doyle Drive replacement project. PSRC also has a deep modeling staff of seven modelers, with a breadth of skills and experience. MTC provides a mechanism (via established relationships and logical role) to extend the

excellent work SFCTA has been doing in San Francisco to the broader Bay Area, in addition to world class travel modeling skills.

In addition, all three agencies maintain an open door policy to any other agency that wants to inquire about or come and learn (either remotely or in person) about their advanced modeling tools. In order to foster this learning, this proposal includes a $5,000 travel (or teleconferencing) budget set aside for the exclusive use of other agencies (or their designee) to come and learn about our development and use of dynamic transit models.

7. Briefly describe your work plan (tasks, deliverables and approximate dates, no more than 1 page total) for your use of the implementation assistance. What is your expected level of agency staff, consultant and university involvement?

Wherever possible, tasks will be led by agency staff to provide a clear sense of ownership and smooth the transition between development and use. Agency Partners will use staff, interns, on-site contractors, key specialists to complete the work. The team will be focused around a core set of contributors for each task with key points of feedback from industry experts. The total cost of this effort is $700,000 plus local matches of in-kind time specified in the answer to Question 10 along with key deliverables. Proposed tasks are:

1. Project Management. This task encompasses the internal and external project management duties including detailed workplan development, contracting and resource management, progress reports and invoices, meetings, and project management.

2. Network Supply Data Development. This tasks encompasses the development of schedule-based transit networks in both regions, access and transfer links, and any setup or maintenance tools to facilitate the continued use of the tool.

3. Transit Demand Data Development. This task will validate, test, and adjust disaggregate transit demand data from the three activity-based models using available observed data in order to make sure that the model input data is consistent.

4. Transit Rider Behavior Development. This task includes the data development from the observed transit route choice and the estimation and calibration of route choice models capable of capturing appropriate heterogeneity in transit rider behavior. This task will be informed by SFCTA's past experience estimating a bicycle route choice model.

5. Data Development for Transit System Performance and Use. This task will organize and develop tools for calculating transit system performance (travel time and reliability) and demand, and validating based on APC, AVL, Fare Card, and On-Board Survey data.

6. Software Implementation Development. This task includes all software evaluation and development activities as they relate to the dynamic transit supply model. It is anticipated

that we will start with the FAST-TrIPs open source code base and set up a rigorous development committee, likely under the auspices of osplanning.org to guide the collaboritve development of the software to meet the Agency Partners' needs. Anticipated development activities center around usability, maintainability, and visualization.

7. Test-case Development. Past DTA development experience has shown the critical importance of test applications. We propose to develop two test scenarios that each have a change in state (i.e. a frequency change) to test and validate model sensitivity.

8. Agency Implementation and Testing. This task encompases the actual deployment of the dynamic transit model at each agency such as nuts and bolts activities and testing.

9. Communications and Outreach. Activities include website updates, fact sheets, technical papers and communicating with other agencies or interested parties. We include travel budget for interested public agency staff and budget for an academic partner to develop graduate course materials for one class including an assignment.

8. To what extent will you be attempting to advance the state-of-practice, for example
   a. Integration of methods from C04 or C05
   b. Integration of methods from other SHRP2 capacity and reliability products
   c. Innovative use of new data sources, such as data hubs and data from ITS

   a. C04, "Improving our Understanding of How Highway Congestion and Price Affect Travel Demand" derived relationships for the behavioral responses to highway congestion, travel-time, reliability, and pricing. While this project is focused on transit users, the Agency Partners will attempt to translate the C04 product when appropriate and applicable to the transit user and use similar equations on the transit side. Because users are likely evaluating the tradeoffs of price, travel time, and reliability between modes when making a mode choice, it is likely that they are choosing their optimal path through the network for both of these modes using similar variables. Our work will also leverage the FAST-TrIPs work taking place in Portland, Oregon, which is developing reliability metrics with FAST-TrIPs. All activity-based models in this proposal use a distributed value of time capable of implementing much of the work proposed in C04.

   b. The techniques utilized to derive highway travel reliability in travel models for L04 can likely be applied to transit as well. Because reliability is one of the key components that the Agency Partners would like to analyze, we anticipate building upon what was done for L04 and translating and extending it for use in the context of transit. We believe that the simulation framework will of dynamic transit assignment will make these methods more easily attainable.

   c. There are variety of innovative data sources being used in this project including person-based GPS from a household travel survey, AVL, APC, and fare card data, smartphone route data and data from tablet-based on-board travel surveys. In all cases, open processing techniques are either in the process of being developed or will be developed or enhanced as part of this project (i.e. https://github.com/UCL/sfdata_wrangler).

9. Describe challenges / risks you expect to encounter in implementation, and how you plan to address them.

   The biggest risk in most leading edge model development projects is being able to devote enough staff time to the project in a reality where there are urgent day-to-day needs. This project proposes an agency partnership strategy that will substantially mitigate this risk and pool staff resources to work collaboratively towards common goals. In this arrangement, trust and respect between all three agencies is key. The modeling leaders at all three partner agencies have worked together either in previous jobs or on significant collaboration within the region. All three agencies are also already involved in collaboratively developing a software platform for activity-based travel models, coordinated through AMPO.

   There are several technical risks that we would like to highlight:

   The existing open-source software for dynamic transit network assignment (FAST-TrIPs) has two primary developers, neither of whom were software engineers. In order to create an easily-maintainable and understandable product, the Agency Partners will need to devote time towards understanding the code and possibly refactoring it to meet their needs. Not currently knowing what is in the black box makes this task a potential time risk.

   One challenge with all simulation-based assignment mechanisms is the computation time associated with skimming the network for all OD pairs for all user classes. It is anticipated that a sampling approach will be used rather than a full skim for all user classes, as proposed by Peter Vovsha in some of the reliability SHRP2 projects, but the details of this approach must be tested in order to understand their ramifications in the whole model system.

   The data sources used in this project are vast, but have not been used all together before. It is possible that they could show conflicting information about the state of the transit system. Therefore, it is likely not as simple as creating some elegant data processing code, but will take resources to sort out which data sources to trust.

   The final risk that I would like to highlight is that of time. The allotted period of performance for this project is 24 months, which is short given the complexity of this project. The Agency Partners do not anticipate that this project will be difficult to complete, but it will be difficult to complete in 24 months.

10. What cost / labor match, if any, is being provided?

    The Agency Partners believe the total cost is $700,000 to deliver the following:

- Production-ready calibrated and validated dynamic transit network model for the Bay Area integrated with SF-CHAMP and tested with preliminary versions of Travel Model Two.

- Functional dynamic transit network model for the Puget Sound region with several rounds of calibration and validation completed and functional integration of SoundCast completed.

- Estimation of a transit route choice model using observed route data.

- Improved software code and development environment for dynamic transit network model software including documentation, improved development environment, and development of a developer and user community.

- Communications and outreach to both technical and consumer audiences. This includes maintaining an online collaboration community, writing technical- and consumer-oriented papers.

- Developing technical capacity in the field at both the university- and agency- level through teaching material development with a professor/graduate-student partner, solicitation of interested other agencies and giving the travel stipends to see what we are working on, and the training and utilization of multiple interns as the core worker in order to broaden the workforce beyond the current usual suspects.

- Development and refinement of open source tools for wrangling and maintaining data banks of transit data.

- Test cases where we have before/after data in order to dynamically validate the model.

- Technical review of our work from experts in multiple functional areas.

The Metropolitan Transportation Commission will provide a labor match in the form of in-kind staff resources and will seek additional funding in the fiscal year 2015/16 (July 2015 to June 2016) budgeting process. Specifically, David Ory will dedicate up to 20 hours per month and MTC staff will pursue up to $100,000 in funding through our internal budgeting process for FY 15/16.

The San Francisco County Transportation Authority will match SHRP2-funded agency staff hours on this project in-kind at 20 percent (up to $100,000), funded by local agency partner contributions from the San Francisco Planning Department and San Francisco Municipal Transportation Agency. Investment in this advanced modeling capability by the San Francisco City Partner agencies represents their desire to improve and use the transit analysis capabilities in the San Francisco modeling system in their planning efforts.

PSRC will contribute in-kind staff hours across team members according to their expertise up to $100,000. These hours will include some allocation for project management and also to junior level modelers and interns to provide support on data collection and organization.

11. What is your plan for adopting the advanced tools in this bundle on a sustainable basis, post SHRP2?

    It is in all of the Agency Partners' interests to build these tools in such a way that their continued maintenance is sustainable and feasible on an on-going basis. All three agencies have a history of sustaining and maintaining advanced travel tools. All three agencies are motivated to develop a dynamic transit network model based on questions being asked of them by planners and decision-makers and anticipate working towards having this be a tool in their toolbox so long as this tool is the best way to answer these types of questions.

    That said, developing a state-of-the-art tool that is easy to use is by no means an easy task and we do not anticipate perfection. However, we do hope to build upon the past experience and lessons learned of all three agencies over the past decade in order to increase our chances of success. These include:

    - Use a substantial portion of the development budget for developing sustainable processes rather than a pasted-together prototype. While this may be at the expense of a far-reaching advancement in practice, the advancement is effectively zero (possibly negative) if the tool is never used on an ongoing basis.

    - Put the agency (who has to live with the tool for the next few decades) in the drivers seat rather than a consultant or software developer (whose interests fade post contract close-out).

    - Value maintainability in the design (simple but easy to lose track of) and resist the "perfect design for today" at the expense of having the tool ready to use again in five years.

    - Develop sustainable staffing, processes, data and funding streams to collect new data, maintain networks, and make incremental improvements.

    - Leverage partnerships and collaborations in order to gain points of views that you may not have been exposed to.

12. What actions will you be taking to broaden the user community of those using advanced methods?
    a. Is another agency that is interested in eventually using advanced modeling methods able to closely follow your efforts?

b. To what extent are you planning outreach, for example, at regional professional meetings?

Our project is inclusive of three agencies, MTC, SFCTA, and PSRC, each at varying stages of implementing a regional integrated activity-based and dynamic network model. The project is designed to leverage the experience and knowledge of a bleeding edge adopter (SFCTA) with an agency that has used an activity-based model for some time (MTC) and an agency on the verge of releasing one (PSRC).

In addition, all three agencies have and will maintain an open door policy to any other agency that wants to inquire about or come and learn (either remotely or in person) about their advanced modeling tools. In order to foster this learning, this proposal includes a $5,000 travel (or teleconferencing) budget set aside for the exclusive use of other agencies (or their designee) to come and learn about our development and use of dynamic transit models.

Locally, MTC and SFCTA regularly present the work of their activity-based and dynamic network modeling at an annual regional ITE modeling workshop, and plan to continue that with this project. In addition, they will discuss and share the work with the Bay Area Model Users Group. PSRC also will present the work to the local Model Users Group and potentially directly to the transit agencies on their sites.

Nationally, the Agency Partners are already prolific writer, organizers, and presenters at technical conferences such as the TRB Annual Meeting, Planning Applications Conference, and Innovations in Travel Modeling and will continue to submit papers, abstracts, and white papers to these conferences on any innovation they are working on, including this project.

The agency partners agree to conduct their project in an open and collaborative online environment similar to the open environment in which SFCTA developed their citywide DTA model (see dta.googlecode.com) in order to provide a transparent and helpful picture of the nuts and bolts of dynamic network modeling and its integration with activity-based travel demand models. This online environment will document tasks, lessons learned, mistakes, and outstanding issues that we are grappling with in addition to successes and results. Key deliverables will be available on this online environment, including an easily-digestible fact-sheet, updated semi-annually, summarizing objectives, progress, issues, and key outcomes.

Recognizing that our next generation of travel modelers are not often given instruction about topics like dynamic transit network models, we will solicit the partnership of a graduate student/professor team to develop one-class worth of lecture and one homework assignment with supporting open-source code and a simple example network problem. We have reserved in budget for this task.

13. Will you have technical reviewer(s) who are outside the immediate project team?

    The Agency Partners anticipate forming a technical advisory team with expertise in areas such as software development, route choice modeling, simulation, integrated modeling and transit. The Agency Partners have contacted several potential members of this team who have been enthusiastic about this potential opportunity and have been willing to donate their time or participate for a nominal fee. Dr Mark Hickman, an expert in the field of person-based dynamic transit assignment and one of the creators of FAST-TrIPs, has confirmed that he will be able to contribute as a pro-bono technical advisor on this project.

    NOTE: Selection Criteria buttons below do not work on my computer: we would like to punch "Integrated Dynamic Travel Model (C10) + C04"

Selection Criteria:

a. Choose an option:

- ○ Integrated Dynamic Travel Model (C10)
- ○ Integrated Dynamic Travel Model (C10) + C04
- ○ Integrated Dynamic Travel Model (C10) + C05

b. Extra credit will be given for:
   - Multi-agency collaboration (e.g., an MPO partnered with a State or local agency with a specific issue or need for the tool).
   - For applications that also make effective use of the concepts in the SHRP2 Reliability Data and Analysis Tools Bundle.

As a reminder:

1. Review all background information located on this product's application page.
2. Once you have completed this form and secured the required Leadership Endorsement Letter, return to application page and complete the contact information fields.
3. Upload this form and the Leadership Endorsement Letter to the page. **Be sure you are attaching the form to the correct application page.**
4. Click "Submit;" you will receive an email confirmation that includes the uploaded endorsement letter and application form.
5. Application period will close June 27, 2014.

For more information or to find this product's application page, visit the Implementation Assistance Program page (http://www.fhwa.dot.gov/GoSHRP2/ImplementationAssistance) on the GoSHRP2 website.