Striving for Excellence:
Oregon DOT's Initiatives in Travel Analysis Tool Development

At A Glance

TMIP

Better Methods. Better Outcomes.

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Overview

The Oregon Department of Transportation (Oregon DOT) is putting into place a number of tools and methods designed to be quick response methods that provide high-level information in a timely and low-cost manner. These tools and methods differ from typical travel model practice. Instead of approaching the problem with increased levels of detail and model complexity, these methods distill useful information from simplified inputs and modeling strategies. They are not designed to predict travel behavior; instead they provide information on how projects and plans can be expected to affect the transportation environment. The following tools, data and methods are profiled below:

• Level of Traffic Stress (LTS)

• Transportation Cost Index (TCI)

• Crowd Sourced Non-Motorized Travel Data

• Fuzzy Systems Dynamics Modeler (FSDM) - Assessing Future Uncertainty

• Integrated Intermodal Data Network

Level of Traffic Stress (LTS)

Based on work published by the Mineta Transportation Institute (MTI Report 11-19, May 2012), Oregon DOT is planning to attribute all networks with a Bicycle Level of Traffic Stress (LTS). The concept elevates consideration from whether or not a rider has access to a bike lane or shoulder, to a larger view of how connected and complete an area's bike network with respect to the different levels of stress or difficulty faced by the rider. Most riders don't want to ride at a high level of stress (for example, on narrow roads with large volumes of high speed motorized traffic. A low-stress rider is unlikely to travel a high level of stress segment, even if 90% of their route would be low stress; such a segment becomes a potential barrier. Oregon DOT's vision is to provide accessibility information for any area at different levels of stress and highlight areas where high stress points are creating breaks in low stress network accessibility. The procedure for applying LTS is presented in Oregon DOT's Analysis Procedures Manual[1].

Transportation Cost Index (TCI)

Proof of concept research conducted by Oregon DOT in 2005 (Reiff and Gregor, SPR 375) developed a multimodal accessibility measure called the Transportation Cost Index (TCI). The TCI can be used to compare transportation performance outcomes for different modes in terms of common metrics. The TCI accomplishes this by building on the concept of the widely-used Consumer Price Index (CPI). Oregon DOT is currently advancing development of this new measure in order to implement it as a standard element in performance measurement and decision-making. Current work is focused on defining the travel market elements (the "market basket") and travel cost calculation for the TCI. The intention is to implement the measure at the state, regional and MPO levels, as well as over time[2].

The TCI will define a basic set of destination needs and quantify how accessible that "market basket" is for a given area. The goal is to provide rapid information related to accessibility

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[1] http://www.oregon.gov/ODOT/TD/TP/pages/apm.aspx

[2] http://www.oregon.gov/ODOT/TD/TP_RES/Pages/ActiveProjects.aspx#SPR_760

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effects of neighborhood or region-wide transportation projects much faster than is possible with typical modeling analysis. The measure will provide an accessibility index used to compare accessibility for all modes. As mentioned earlier, Level of Traffic Stress would also be used to sub-set bike accessibility into different stress networks, so the accessibility of high-stress and low-stress bike routes could also be provided.

Crowd Sourced Non-Motorized Travel Data

Oregon DOT recently purchased access to a novel dataset on bicycle routes from Strava[3] . Strava Metro is crowd sourced via a smartphone app and data uploads to Strava from third party GPS units. This proprietary product, which supplements existing data with a new dataset holds great promise for improving understanding of how the transportation system is used. The Strava data can used, for example, alongside a "pillar" data source such as permanent bike counters. Such counters can't be put on every link in a region, but they could be placed in key locations and supplemented with crowd sourced data. Oregon DOT has been using the Strava dataset to fill in information gaps and improve understanding of areas where little or no bicycle information exists. This type of data is also being used to help prioritize where traditional data should be collected. The potential of crowd sourced datasets to provide information about non-motorized modes is great, especially where no other information is available, and is expected to improve decision making.

ODOT has also developed its own cell phone app called, "ORcycle"[4], which is now available for download from both Google Play and Apple's App Store[5]. ORcycle lets users record cycling trips, display maps of the rides, and provide feedback regarding crashes, safety, or infrastructure issues, identifying specific locations of concern on their route. ORcycle is a platform that provides a unique data set that includes not only the GPS based location of users' cycling routes, but also crash data (including near-misses), safety issues and challenging locations as reported by the users. In addition data includes basic user socio-demographic data, biking preferences, and rider comfort level after riding each recorded real-world route.

The goal is to use the route and route comfort data collected via ORcycle to validate and calibrate Bicycle LOS and LTS measurements to Oregon riders and conditions, as well as Oregon-specific bicycling facilities. Future versions of the application may also expand the ability to collect via crowd-sourcing, infrastructure data that can be used to help complete a statewide bike and pedestrian inventory of system conditions for planning and modeling.

Fuzzy Systems Dynamics Modeler (FSDM) - Assessing Future Uncertainty

Oregon DOT is conducting research to explore potential topics and emerging issues that might influence future travel demand. Phase 1 of the research identified the range of characteristics with potential to impact the performance measures (PMs) used by Oregon DOT in modeling and analysis. Phase 2 of the research focused on evaluating the effect of

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[3] http://www.strava.com/

[4] http://www.pdx.edu/transportation-lab/orcycle

[5] http://www.oregon.gov/ODOT/TD/TP_RES/Pages/ActiveProjects.aspx#SPR_754

technologies and forces, such as autonomous vehicles, on travel behavior in the next 20 to 40 years. A fuzzy cognitive map was developed to illustrate the relationships between different characteristics in an explicit and quantifiable manner. Phase 2 led to the development of the Fuzzy Systems Dynamics Modeler tool. The tool can evaluate a large range of possible future outcomes in order to develop an assessment of uncertainty associated with potential future effects.

The research has not been to answer what will happen, but rather to provide a plausible range of outcomes formulated in outputs such as "this technology could increase measure X by –Y% to +Z%". Technologies (like autonomous and light-weight electric vehicles) that could change the PMs by the largest amount would be investigated further (low impact technologies might be able to be ignored for now, or simply dropped from further consideration). This tool allows for a large range of possible future outcomes to be tested, which can help to develop ranges of uncertainty related to potential future changes.

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Integrated Intermodal Data Network

Oregon DOT is somewhat unique in that a unit of roughly 16 people conducts modeling and analysis work from high level land use modeling and statewide strategic policy questions, through urban travel demand models at the MPO and smaller city level, down to micro-simulation analysis for specific corridors and project areas for NEPA and engineering-level analysis. Because regional level (macro) work can be transferred to more detailed (meso) work, and then in turn further analyzed in microscopic simulation; there are many efficiencies that can be gained by reducing the effort to transfer information and results between tools, process, and steps. To support such multi-resolution modeling, Oregon DOT is testing an "Integrated Intermodal Data Network" for network inventory storage to support a flexible software platform. Figure 1 illustrates the application of the Intermodal Data Network: a series of multimodal network attributes (blue boxes) are coded onto an all-streets network; this single source of information feeds a variety of tools (green boxes), some of these tools and processes feed information back to the network (not shown in the diagram) or create other pieces of information to inform the tools and process (pink boxes); and these tools, processes, and information then are used to develop performance measures for making decisions (yellow boxes). The process is still in testing, but is expected to create efficiency and cost savings for Oregon DOT and its partners who rely on Oregon DOT for comprehensive transportation network data.

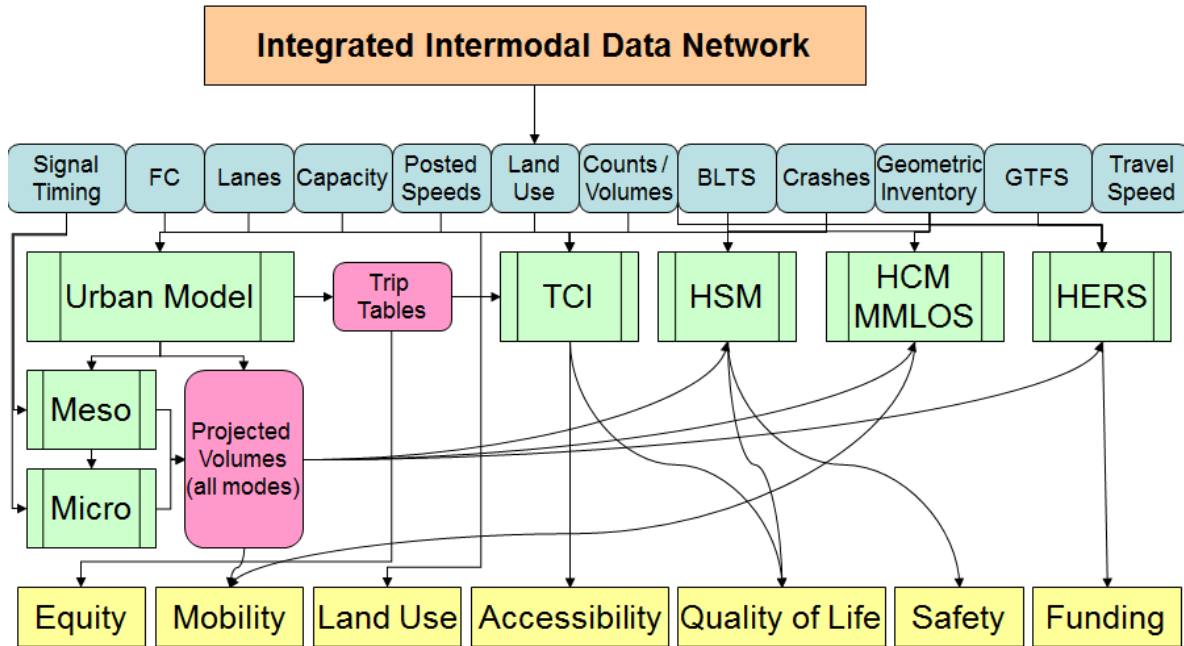For more information, please contact Alex Bettinardi at Alexander.O.BETTINARDI@odot.state.or.us.

Figure 1[6]

Further Information

The Oregon Department of Transportation recently completed a "Snapshot" document in collaboration with the Federal Highway Administration's (FHWA) Travel Model Improvement Program (TMIP) that provides information about Oregon's other modeling tool set and methods. The report is available at http://www.fhwa.dot.gov/planning/tmip/publications/other_reports/oregon_snapshot/index.cfm. More information on Oregon DOT itself is available at http://www.oregon.gov/ODOT/Pages/about_us.aspx.

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[6] FC = Functional Class; BLTS = Bicycle Level of Traffic Stress; GTFS = Generalize Transit Feed Specification; TCI = Travel Cost Index; HSM = Highway Safety Manual; HCM = Highway Capacity Manual; MMLOS = Multi-Modal Level of Service; HERS = Highway Economic Requirement System; Meso and Micro refer to mescoscopic and microscopic travel simulation models.