Research Problem Statement

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I. TITLE

17-035 New Data Sources and Transportation Technologies: human resources, best practices, opportunities, and threads

II. PROBLEM

Autonomous and connected vehicles are likely to change the way transportation systems are planned and operated. The communication and/or data collection potential of new sensors, smartphones and social media can have a deep impact on the way transportation facilities are operated, managed, and planned in the near future. Americans spend more time using mobile phones and social media than driving and eating. Transportation agencies have been slow to adapt to and/or exploit these changes. While some of these technologies and changes are clearly outside the core and/or traditional competency of ODOT, nonetheless, they are going to deeply affect how ODOT works in the future. ODOT needs to start preparing to face new technological challenges in areas related to new data sources and transportation technologies.

Connected vehicle-infrastructure will require numerous sensors and new devices to improve mobility – sending green time info to a car – or to improve safety – a traffic signal can send a warning to a car before it turns red or when it detects a pedestrian or cyclist on its way (1). Crowdsourcing has also been identified as one of the key future technologies that transportation agencies can take advantage of to improve data quality, coverage, and cost. Some transportation agencies already use or have some type of successful crowdsourced data collection process. For example, the District of Columbia extracts and analyzes social media content (i.e. TWITTER) for incident management and incident collection (2). Some crowdsourced data can be first gathered by private vendors and then sold to agencies; for example, ODOT has acquired INRIX data. As part of an ODOT sponsored research project a smartphone application (ORcycle) was successfully developed to collect cyclists' feedback, route and comfort levels data (3). Bottom-up efforts can quickly develop to collect data without any large private company or government involvement. For example, there are several websites that collect bicycle and pedestrian crash data. A potential problem with independent efforts is that ODOT may not have a process to utilize the data and there may also arise liability, staffing, and/or procedural complications.

Some state DOTs, for example UDOT, are successfully developing mobile tools to crowdsource valuable weather and current road conditions data along specific roadway segments across Utah (4). For example, volunteer citizens have provided highly useful information about dangerous snow storms, dangerous driving conditions, and snow blocked roads. This information is vital in remote rural areas where it is not viable to accurately monitor weather and road conditions. UDOT indicates that the accuracy rate of the reports is very high, only 0.03% of incoming reports is determined to be inaccurate.

Finally, human resources are also not evolving at the pace of technological change. New staff with non-traditional technical skills maybe needed now and certainly many more will be required in the near future (5). ***It is forecasted that a 30 percent of current ODOT employees will become eligible for retirement in the next three years (6).*** ODOT has a very successful College Internship Program (CIP). However, CIP currently focuses mostly on providing practical or hands-on experience.

III. PROPOSED RESEARCH, DEVELOPMENT, OR TECHNICAL TRANSFER ACTIVITY

The proposed research activity will involve:

1. Conducting a review of best practices. How other are other state DOTs adapting to changes in information and communication technologies? What type of institutional changes have been implemented?

2. Survey US and international tools: What type of crowdsourcing and sensor applications are successfully deployed? What tools are successful in urban and/or rural areas? What mobility, safety, or environmental benefits can be gained?
3. Conducting an ODOT survey to compile and understand current ODOT recruitment practices and skillsets targets and what different ODOT units may require in terms of human resources and new skills.
4. Analysis of the opportunities and threads that different ODOT units can identify regarding new technologies and data sources. Identification of skill gaps.
5. Analysis of workforce development needs: how do the curricula currently in place at state academic institutions meet the current and future needs of ODOT? What kind of engineers will be needed in the near- or medium future? What are other DOTs doing to address this problem?

IV. POTENTIAL BENEFITS

Agencies cannot operate without qualified staff. As ODOT is facing a major generational shift it is timely to start preparing a framework to attract, train and/or retrain qualified staff with non-traditional coding, sensor, data mining, and modeling skills. ODOT already has a successful College Internship Program (CIP). New programs that focus on the development of non-traditional technical skills will benefit from this research.

V. IMPLEMENTATION

The results from this research will be useful to guide ODOT's training and human resources efforts. This work would result in a set of list of opportunities and skills gaps that ODOT staff and units are currently observing. Recommendation can inform the Oregon DOT College Internship Program (CIP) future training efforts.

VI. LIST OF REFERENCES

(1). Connected vehicle, http://ops.fhwa.dot.gov/travelinfo/infostructure/aboutinfo.htm
(2). Fu, K., Nune, R., & Tao, J. X. (2015). Social Media Data Analysis for Traffic Incident Detection and Management. In Transportation Research Board 94th Annual Meeting (No. 15-4022).
(3). ODOT RSP 768 (2014), Evaluating the Use of Crowdsourcing as a Data Collection Method for Bicycle Performance Measures and Identification of Facility Improvement Needs
(4) Mobile technologies and crowdsourcing can empower individuals who want to improve safety and report valuable real-time data. UDOT Citizen Reporter Program, http://blog.udot.utah.gov/2014/08/udot-citizen-reporter-program-gathers-volunteer-data/
(5) NCHRP 685 (2011). Strategies to attract and retain a capable transportation workforce, Transportation Research Board.
(6) http://www.oregon.gov/odot/cs/hr/pages/careerops.aspx

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****** This research project applies to multiple ODOT units since it deals with human resources as well as technologies that will impact mobility, safety, and the environment. ODOT staff from different units (Traffic-Roadway Section – Transportation Planning Analysis Unit) support for this idea and can be easily named. But, it does not seem appropriate to identify now specific "silos" since the project aims to look at broad technological changes that affect many units. Most ODOT units will be surveyed and will benefit from this project.***

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