Workforce Development for the Digital Age

AASHTO
Workforce Development Initiative for TSM&O

Oct 8th, 2017

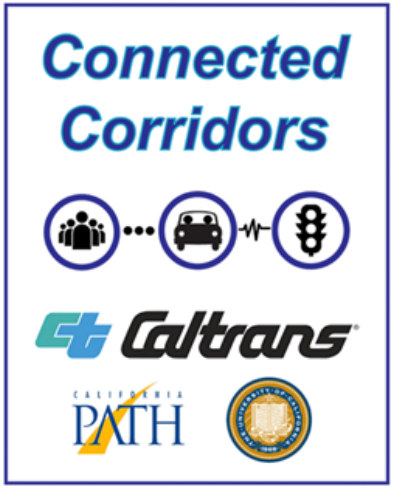
Joe Butler – UC Berkeley PATH
Wednesday, Oct 8th

Introduction – Joe Butler

- Work at PATH - UC Berkeley Institute of Transportation Studies
- I have been an engineering manager for over 30 years. Masters degree in software engineering
- Currently the program manager for the Caltrans Connected Corridors Program, a large program bringing ICM to many corridors in Ca.
- In this position I regularly interact with many different transportation personnel who are trying to learn/do TSM&O.
- I also regularly interact with Civil, Electrical, Transportation, Software and (new) Data Engineering professors and students at both the graduate and undergraduate level

Connected Corridors State Wide Program

- **Bringing ICM to major corridors in California**
- **Growing Caltrans leadership in corridor based transportation management**
- **Showcasing new technologies and processes**
- **Provide guidance on workforce skills, training and organization**
- **Enable the consulting ecosystem**



Problem Statement

- **TSM&O requires a heterogeneous mix of multiple hard and soft skills**
- **The hard skills include civil, traffic, electrical, mechanical, software and data engineering**
- **The soft skills include communication, emotional acuity, leadership, and general management skills**
- **Current educational, training, consulting and hiring practices are not adequately providing either the hard or soft skills**

What is the Digital Age

- Data sensing everywhere
- IP communication everywhere, unlimited bandwidth
- People communicate all the time using multiple media/apps
- Software is everywhere
- Data Analysis is everywhere
- AI/Machine/Deep Learning soon to be incorporated into everything
- Robots taking over by combining data sensing, software, AI and analysis

Software and data

- Education is teaching someone to use new abstractions, to solve problems in new ways.
- Software and data are new ways of viewing the world and solving problems
- We need to educate the transportation world on software and data
- Even traffic engineers have difficulty with simulation software
- I was talking to a software engineer who had offered to setup a small system to monitor ITS elements. A weeks worth of work. He said that the transportation managers were in awe of that fact that this could be done so quickly and easily
- I was in a meeting where a Google software engineer was discussing his creation – GTFS. One of the professors asked a question "How could a software engineer have created this? He looked dumbfounded and said "What do you think we do?"

Education with no jobs can be difficult

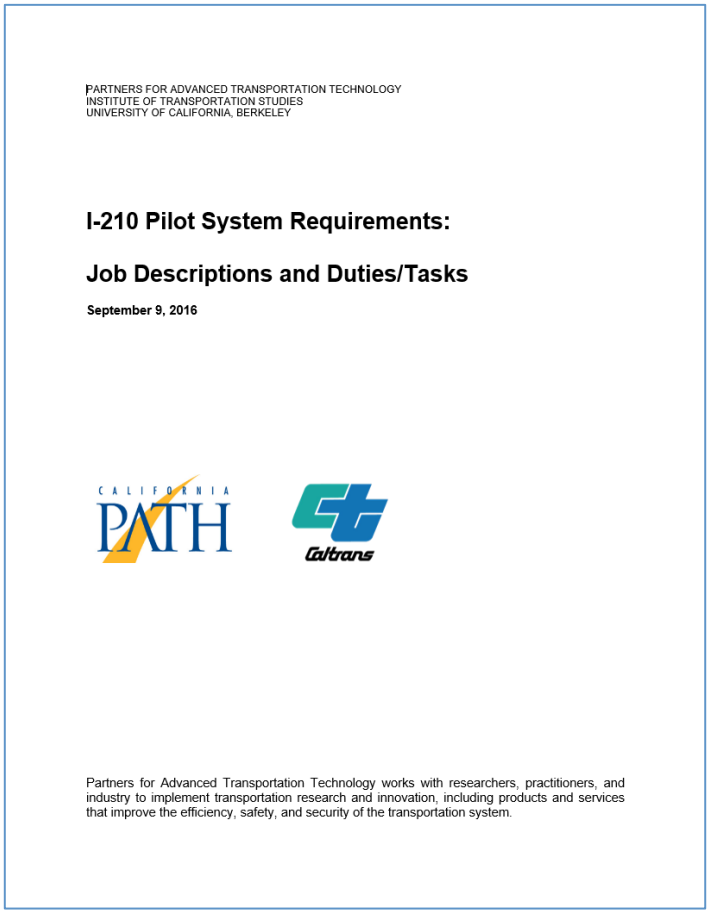
- **TSM&O requires many different engineering disciplines**
  - Civil, Traffic, Electrical, Mechanical, Software, Data
- **Within Caltrans there are no job classifications for software or data engineers.**
- **So they can't even be hired. Without the option of employment, it is difficult to encourage them to learn about transportation.**
- **This makes TSM&O very difficult as all disciplines need to work together to support real time data based decision support systems.**
- **Other engineering professions and managers appear to be wary or unaware of software and big data. This was true in the tech industry 30 years ago.**

Soft Skills

- **Most engineers in transportation have less developed interpersonal and people management skills**
- **These are not really part of the job descriptions or promotion path.**
- **Especially difficult when organizations only promote from within**
- **These skills need to be developed in the University, hired for and rewarded.**
- **In actuality, it appears that soft skills are not respected. I think we need to start having a certification test for listening, empathy and leadership.**

CC Workforce skills, training and organization

- KSA (Knowledge, Skills and Abilities) developed by Kimley Horn
- Organizational structures developed by SMG
- ICM Duties and Tasks (Human Requirements) developed by PATH
- Developing a short white paper for the Ca legislature on work force skills required for the digital age



PARTNERS FOR ADVANCED TRANSPORTATION TECHNOLOGY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

I-210 Pilot System Requirements:

Job Descriptions and Duties/Tasks

September 9, 2016

Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.

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- Corridor Champions
- Corridor Manager
- Corridor Technical Manager
- Corridor Data Analyst
- Traffic Engineers
- Data Analysts
- Software Engineers
- Electrical Engineers
- Database Administrators
- Stakeholders
- Maintenance Staff
- Information Technology Support
- Information Technology Security
- TMC/TCS Operators
- Transit Field Supervisors
- Public Information Officers
- First Responders
- Outreach and Communications Manager

Education Goals

- **Educate the educators**
  - Professors in these fields are not aware of software and data
  - Training and consulting organizations
  - Need cross disciplinary educational centers
- **Educate students**
  - Educate civil, transportation and electrical engineering students in the basics of data analysis and basic software development so they can interact effectively with other engineers
  - Provide new classes bringing transportation, software and data together. We have designed a new class:
    - **Remarks:** Students will learn the basic concepts, methods and tools needed to design a decision process for managing mobility in complex transportation corridors. The lectures will focus on cyber physical and cyber social systems, sensors, data, processing and machine learning. The labs will provide hand on experience with data management and analysis tools and the application of machine learning to the data. The I-210 Test bed will provide real world data and problems.
- **Educate government agencies**
  - Educate management and **unions** in the need for software and data engineers
  - Provide introductions to other engineers in software and data

Recommendations

- **Information campaign focused on showing benefit of new skills and additional resources**
- **Seed grants to Universities to:**
  - Hire associate professors with the right skills
  - Develop new courseware
  - Initial teaching of this courseware
- **Outreach plan for unions**
- **Outreach plan for agency managers**
- **Seed grants or something to consulting agencies to help them transition**

Thank You