ITS ePrimer
Module 14: Emerging Opportunities and Challenges

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ITS Professional Capacity Building Program
ITS Joint Program Office
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Instructor

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Learning Objectives

- ITS: Past, Present and Future
- What Are Emerging Trends That Will Affect ITS?
- What Are The Opportunities And Challenges For Transportation Professionals?
- Looking Ahead
Purpose

Understand How ITS Has Developed To Date

Understand The Past, Present And Future Roles Played By The Public And Private Sectors

Identify Key Technological And Societal Trends That Are Shaping The Future Of ITS

Look Ahead At Possibilities In The Future
ITS: Past, Present and Future
6 Major Trends in Technology and Society

- Rapid societal adoption
- Declining levels of federal funding
- Distracted drivers, bicyclists and pedestrians are increasing traffic fatalities
- Rapid developments for automotive use
- Technological advances enabling varying levels of “self-driving vehicles”

- Transportation Infrastructure
- Smart Phones
- Sensors and Controls
- Influencing ITS
- “Self-driving Vehicles”
- “Smart Cities”
- Traffic Fatalities

Big Data, Extreme Computing, Internet of Things, Mesh Networks, etc.
## The First 20 years of ITS (1991-2010)

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Public Sector</th>
<th>Private Sector</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1) Maintain physical transportation infrastructure 2) Build ITS architecture and tools for “Vehicle to Infrastructure and Vehicle to Vehicle (V2X)”</td>
<td>Contract services to public sector to build physical and IT infrastructures</td>
</tr>
<tr>
<td>Vehicles</td>
<td>Mandate vehicle ITS standards and devices to interface with ITS architectures and tools</td>
<td>Incremental improvements in safety and reliability</td>
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<tr>
<td>Travelers</td>
<td>Collect traffic information to disseminate to travelers for “intelligent” travel choices</td>
<td>Use traffic data provided by public sector to make smarter travel choices</td>
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Technological Breakthroughs Influence the Maturation of ITS (2010-2015)

<table>
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<tr>
<th>Infra—structure</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Vehicles</td>
<td>1) Physical: Struggling to maintain status quo 2) ITS: Transitioning from V2X to “Connected &amp; Automated (sic) Vehicles”</td>
<td>Smart Cities, Internet of Things, Big Data, Cloud Computing, Mesh Networks, etc. are rapidly creating traffic and travel data <em>owned by the private sector</em></td>
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<tr>
<td></td>
<td>NHTSA Defines Autonomous Driving Levels 1-5</td>
<td>Powerful sensors, computers and controls are significantly improving collision avoidance at the individual vehicle level</td>
</tr>
<tr>
<td>Travelers</td>
<td>Disseminating enhanced public sector network traffic data by combining it with privately collected, crowd-sourced data (e.g., WAZE, Google Maps, etc.)</td>
<td>ITS is shifting from <em>system to user-optimization</em> with high penetration of smart phones and highly accurate traffic/travel apps using crowd-sourced data</td>
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# Major Shift in Public and Private Sector Roles (2016-Future)

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<tbody>
<tr>
<td>Focus will be on repairing and maintaining physical infrastructure (including ordinary traffic engineering and signage as well as expanding intelligent traffic signal systems to improve traffic flow)</td>
<td></td>
<td>Transportation Networks will become elements of Smart Cities, and the private sector will own much of the data</td>
</tr>
<tr>
<td>Vehicles</td>
<td>Will promote advances in collision avoidance systems to reduce V2V and “Vehicle-to-Pedestrian” (V2P) collisions</td>
<td>Vehicles will become Internet Protocol (IP) nodes, collecting data for Smart Cities companies</td>
</tr>
<tr>
<td>Travelers</td>
<td>Step up efforts to reduce collisions resulting from distracted driver and distracted pedestrians/bicycles.</td>
<td>Travelers will make trip choices based on user-optimized constraints, subject to algorithms used by private companies providing crowd-sourced traffic information and navigation services</td>
</tr>
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</table>
Summary/Looking Ahead
Summary

Society as a whole must manage the opportunities offered by technology as well as the challenges created by those same technologies (e.g., collisions caused by distracted travelers).

Private Sector will lead investment in ITS infrastructure, vehicles and travelers.

Public Sector will strive to ensure safe and reliable physical infrastructure.

Looking Ahead
Opportunities and Challenges for Transportation Professionals
Opportunities and Challenges for Transportation Professionals

1 “It’s the Data”

- Whomever owns transportation and traffic data will have the most influence over how ITS will evolve

- Public-private partnerships that can collect, mine, clean and analyze the data together will create the potential for dramatically improving the health and well-being of our cities and urban regions
Opportunities and Challenges for Transportation Professionals

“Traditional” transportation planning, design, engineering, construction, operations and maintenance are still critical

- These disciplines must “keep up” by becoming smarter, faster and less expensive with new techniques, materials, management information systems in order to continue to deliver safe and reliable infrastructure for society

ITS and traditional transportation professionals must keep up with technological and societal trends in order to stay relevant and productive
References and Resources
References

- Big Data, Extreme Computing, Mesh Networks and Internet of Things
  - http://www.mcs.anl.gov/group/extreme-computing
References (cont'd)

- **Data enabling Smart Cities**
  - [https://www.transportation.gov/smartcity](https://www.transportation.gov/smartcity)
  - [http://www.vulcan.com/Areas-of-Practice/Philanthropy/Key-Initiatives/Smart-City-Challenge](http://www.vulcan.com/Areas-of-Practice/Philanthropy/Key-Initiatives/Smart-City-Challenge)

- **Rapid societal adoption of smart phones**

- **Apps enabled by crowd-sourced data**
  - [https://www.getaround.com](https://www.getaround.com)
  - [https://www.waze.com](https://www.waze.com)
References (cont'd)

- **Rapid developments in sensors and controls for automotive use**

- **Technological advances enabling self-driving**

- **Declining levels of funding for transportation infrastructure**
  - [https://www.transportation.gov/highway-trust-fund-ticker](https://www.transportation.gov/highway-trust-fund-ticker)
References (cont'd)

- Distracted travelers are increasing traffic fatalities
  - http://www.distraction.gov
  - http://www.cdc.gov/motorvehiclesafety/distracted_driving/
  - http://bits.blogs.nytimes.com/2013/07/24/lahood-says-companies-must-wake-up-to-distracted-driving/?_r=0
References (cont'd)

- Professional Associations:
  - American Association of State Highway Transportation Officials: http://tig.transportation.org
  - Institute of Electrical and Electronic Engineers: http://www.comsoc.org/
  - Institute of Transportation Engineers: http://www.ite.org/standards/index.asp
  - International Bridge, Tunnel and Turnpike Association: http://www.ibtta.org/Tollways/List.cfm
  - Society of Automotive Engineers: http://training.sae.org/seminars/c1025/
References (cont'd)

- **Federal:**
  - [http://www.cdc.gov/motorvehiclesafety/distracted_driving/](http://www.cdc.gov/motorvehiclesafety/distracted_driving/)

- **Media:**
  - [http://www.wired.com/](http://www.wired.com/)
  - [http://thinkinghighways.com/](http://thinkinghighways.com/)
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- CITE: www.citeconsortium.org

- ITE Webinars: www.ite.org

Thank you!
Review Questions

1. How have the roles of the public and private sectors evolved since the founding of ITS?
2. What aspects of crowd-sourced data collection have facilitated the emerging benefits across society?
3. What is a new problem that is emerging alongside the benefits with the widespread adoption of crowd-sourced data collection tools such as smartphones?
4. What roles do the traditional transportation professions play going forward?