UNITED STATES
DEPARTMENT OF TRANSPORTATION

ITS ePrimer
Module 14: Emerging Opportunities and Challenges

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Learning Objectives

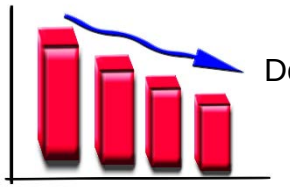
- ITS: Past, Present and Future
- What Are Emerging Trends That Will Affect ITS?
- What Are The Opportunities And Challenges For Transportation Professionals?
- Looking Ahead

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

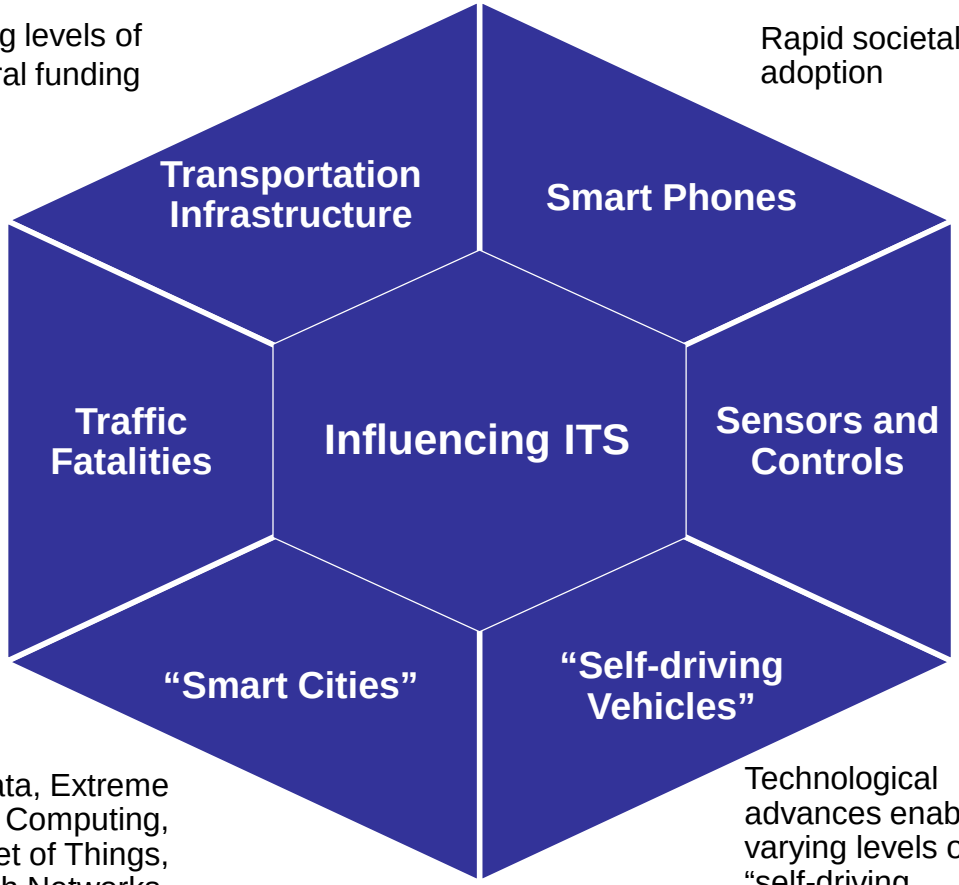
6 Major Trends in Technology and Society



Declining levels of federal funding

Rapid societal adoption

Distracted drivers, bicyclists and pedestrians are increasing traffic fatalities



Rapid developments for automotive use

Big Data, Extreme Computing, Internet of Things, Mesh Networks, etc.

Technological advances enabling varying levels of “self-driving vehicles”

The First 20 years of ITS (1991-2010)

	Public Sector	Private Sector
Infra—structure	1) Maintain physical transportation infrastructure 2) Build ITS architecture and tools for “Vehicle to Infrastructure and Vehicle to Vehicle (V2X)”	Contract services to public sector to build physical and IT infrastructures
Vehicles	Mandate vehicle ITS standards and devices to interface with ITS architectures and tools	Incremental improvements in safety and reliability
Travelers	Collect traffic information to disseminate to travelers for “intelligent” travel choices	Use traffic data provided by public sector to make smarter travel choices

Technological Breakthroughs Influence the Maturation of ITS (2010-2015)

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

Major Shift in Public and Private Sector Roles (2016-Future)

	Public Sector	Private Sector
Infra—structure	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)	Transportation Networks will become elements of Smart Cities, and the private sector will own much of the data
Vehicles	Will promote advances in collision avoidance systems to reduce V2V and “Vehicle-to-Pedestrian” (V2P) collisions	Vehicles will become Internet Protocol (IP) nodes, collecting data for Smart Cities companies
Travelers	Step up efforts to reduce collisions resulting from distracted driver and distracted pedestrians/bicycles.	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

Summary/Looking Ahead

Summary

Private Sector

will lead investment in ITS infrastructure, vehicles and travelers

Public Sector

will strive to ensure safe and reliable physical infrastructure

Looking Ahead

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)

Opportunities and Challenges for Transportation Professionals

Opportunities and Challenges for Transportation Professionals

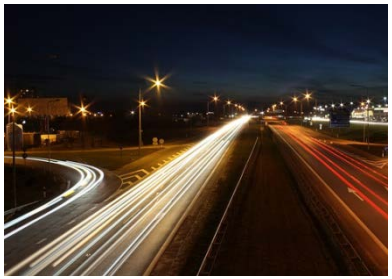
1 "It's the Data"

- 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

❷ "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



❸ 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.ciscoinvestments.com/news/veniam-announces-22-million-series-b-funding-disrupt-connected-vehicles-smart-cities/
  - http://www.forbes.com/sites/bernardmarr/2016/03/15/17-predictions-about-the-future-of-big-data-everyone-should-read/#4efa3da8157c
  - http://www.forbes.com/sites/louiscolumbus/2016/01/18/2016-roundup-of-cloud-computing-and-enterprise-software-predictions/#493d1ae12230
  - http://www.securitymagazine.com/articles/84986-how-mesh-networks-form-the-backbone-of-smart-cities
  - http://www.masstransitmag.com/blog/12125778/kinetic-mesh-networks-improve-mass-transit-communications
  - http://www.mcs.anl.gov/group/extreme-computing
  - http://www.techradar.com/us/news/internet/10-ways-the-internet-of-things-could-change-the-world-in-2016-1310631

References (cont'd)

- **Data enabling Smart Cities**
  - https://www.transportation.gov/smartcity
  - http://www.its.dot.gov/itspac/Dec2014/Smart_Connected_City_FINAL_111314.pdf
  - http://www.vulcan.com/Areas-of-Practice/Philanthropy/Key-Initiatives/Smart-City-Challenge
  - http://smartcitiescouncil.com/smart-cities-information-center/transportation
- **Rapid societal adoption of smart phones**
  - http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/
  - http://www.statista.com/statistics/201182/forecast-of-smartphone-users-in-the-us/
- **Apps enabled by crowd-sourced data**
  - https://www.getaround.com
  - https://www.waze.com

References (cont'd)

- **Rapid developments in sensors and controls for automotive use**
  - http://www.iihs.org/iihs/ratings/crash-avoidance-features
  - http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development
  - http://www.densodynamics.com/all-about-v2x-talking-car-technology/
- **Technological advances enabling self-driving**
  - http://www.extremetech.com/tag/self-driving-cars
- **Declining levels of funding for transportation infrastructure**
  - http://www.pbs.org/newshour/making-sense/highway-trust-fund-keeps-bridges-falling-will-congress-pay-bill/
  - 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://www.nhtsa.gov
  - http://bits.blogs.nytimes.com/2013/07/24/lahood-says-companies-must-wake-up-to-distracted-driving/?_r=0
  - http://www.nytimes.com/2016/02/24/science/driving-distractions-study.html

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.its.dot.gov/
  - http://www.cdc.gov/motorvehiclesafety/distracted_driving/
  - http://www.nhtsa.gov

- **Media:**
  - http://www.technologyreview.com/
  - http://www.engadget.com/
  - http://www.wired.com/
  - http://thinkinghighways.com/

For More Information

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Contact and Resources

- **ITS ePrimer: https://www.pcb.its.dot.gov/eprimer.aspx**
- **T3 Webinars: T3@dot.gov**
- **ITS Professional Capacity Building (PCB): http://www.pcb.its.dot.gov**
- **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?