

# TEXAS TECHNOLOGY TASK FORCE



THE UNIVERSITY OF TEXAS AT AUSTIN  
**CENTER FOR TRANSPORTATION RESEARCH**

## Technical Memorandum#0-6902-TM2

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## 1 Introduction

The intent of this research project is to form a core knowledge group, known as the Texas Technology Task Force (TTTF), and a network of subject matter experts (SMEs) that will identify emerging technologies with the potential to transform Texas's transportation system. The TTTF and UT-Austin research team will analyze potential impacts of the technologies and use the analysis to inform the development of key strategies to select and promote the most critical of these technologies. The Task Force is committed to advancing the development of a high-performance transportation system to position Texas as the leading nexus of economic activity and technological innovation. Since its inception in February 2013, the Task Force has supported the Texas Department of Transportation (TxDOT) by outlining clear actionable strategies and enhancing the delivery of quality transportation services. The Task Force has progressed through three phases that are described below.

*Inception:* Authorized by Texas's 83<sup>rd</sup> Legislature, General Appropriations Bill S.B. No. 1 Item 44 VII-31, TxDOT established the TTTF in early 2013 to develop a vision for the future of Texas's transportation system.

*Phase I:* (February to August 2013) Began with a core knowledge group that sought experts in various transportation technologies. The initial Emerging Technology Portfolio was presented and a public-private consortium was established to further develop key emerging technologies.

*Phase II:* (September to December 2013) Focused on the background research pertaining to the Strategic Technology Business Plan (STBP) and outlined steps for completion in the next phases.

*Phase III (current):* (September 2014 to December 2015) Dedicated to updating the Emerging Technology Portfolio, developing white papers on critical technologies, and drafting initial chapters of the STBP. Already in this phase, the research team has prepared the following three products: 1) *Updated List of Task Force Members* (P1), 2) *Emerging Transportation Technology Portfolio* (P2), 3) *Critical Transportation Technologies (Preliminary Analysis)* (P3).

The remainder of this technical memorandum reports concluding work for Phase III—specifically, on the prioritization of top technologies in the Emerging Technology Portfolio to identify and recommend technology opportunity areas in STBP in next phases. Next steps are provided.

## 2 Emerging Technology Portfolio

The second project deliverable in Phase III work provides an overview of the development of the full *Emerging Transportation Technology Portfolio* (December 31, 2014) derived from one-on-one interviews with Task Force members, TxDOT leadership, and SMEs. The resulting technology groupings from the portfolio are shown in Figure 1.

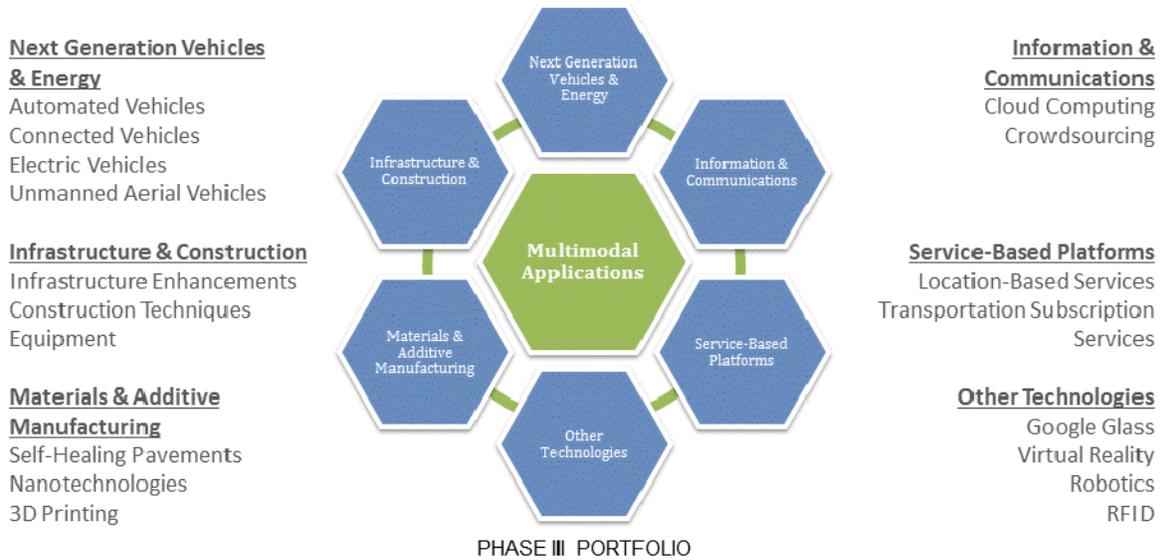


Figure 1: Full Emerging Technology Portfolio

### 3 Technologies Down-Selection and Prioritization

Concluding work for Phase III focused on the down-selection, or prioritization, of the top five technologies from the original portfolio for focused discussion at the final TTTF meeting of 2015. The technologies were prioritized in terms of their ability to further TxDOT transportation goals with focus placed on mitigating congestion, improving safety, and supporting economic development. The intent of this process is to proceed by investigate top-priority technologies while continually monitoring and re-evaluating non-top-priority technologies periodically.

For the prioritization process, the Task Force was asked two sets of questions through an online survey. Survey questions are listed below.

1. Please rank the top 5 technologies that you believe the Task Force should further consider for future pilot programs, partnerships, or statewide initiatives. Please assign your top technologies using the numbers 1-5. Consider the technologies that you believe will align with goals such as improving safety, reducing congestion, improving connectivity, etc.
  - Autonomous vehicles
  - Connected vehicles
  - Drones/UAS
  - Electric Vehicles
  - Electric systems (e.g., charging infrastructure)
  - Alternative Fuels
  - Cloud Computing
  - Big Data analytics
  - Location Based services
  - Transportation Subscription services
  - Materials (e.g. self-healing materials)
  - Nanotechnology
  - 3D printing
  - Virtual Reality
  - Robotics
  - RFID
  - Other
  
2. The Task Force is interested in finding suitable applications of critical technologies to demonstrate how each could be used to improve transportation in Texas. Which 3 of the following opportunity areas do you believe should be further explored?
  - Interconnected freight systems or systematic interfacing of modes
  - Open data environment

- Emergency Response Drone/UAV program
- Internet of Things
- Statewide traffic management center—big data, passenger traveler information
- Alternative energy through advanced battery and/or charging systems
- Other

#### 4 Technologies Down-Selection and Prioritization Results

The resulting top five technologies for prioritization and further consideration in order of importance were

1. Autonomous Vehicles
2. Connected Vehicles
3. Big Data
4. Drones/UAS
5. Electric Vehicles

Other indicated technologies included other vehicle-to-infrastructure (V2I) technology to harvest capacity-enhancing potential of connected and autonomous vehicle technology, mobility as a service, and artificial intelligence.

The resulting three technology opportunity areas identified for further consideration were

1. Interconnected freight systems
2. Open data environment
3. Internet of Things

Other proposed areas included next-generation communication hardware (e.g., fiber optic) for V2I communication and autonomous and connected vehicle applications for increased roadway capacity.

The results of the survey were presented to the Task Force at the December 2015 meeting. A workshop was conducted at the meeting with dedicated discussion for each of the top five technologies.

#### 5 Critical Technology Workshop and Next Steps

The following topics as they relate to each of the five top priority technology areas were discussed among the Task Force members during the meeting workshop.

- **High Level Solutions**

Discussion of high level solutions to illustrate the feasibility of a few technology applications as related to the Task Force objectives. Consideration of sufficient information for the preparation of a business case for each.

- **Benefits & Barriers**

Consideration of the advantages of technology adoption and potential barriers that may be encountered. For various applications of the technology, consideration of the specification of any special technical requirements or other constraints that will be need to be overcome.

- **Market Opportunities**

Characterization of problems that the technology could solve and description of need(s) that are not being met in order to support the adoption or deployment of the technology.

Identification of areas that have the right resources or conditions to support technology demonstrations or application.

- **Stakeholder Identification**

Consideration of any involvement needed from industry partners or public agencies. Identification of stakeholders as well as their individual interests and level of involvement.

- **Future Research Areas**

Identification of gaps in knowledge and anticipation of information required by decision makers.

Through discussion on each area, Task Force members emphasized autonomous and connected vehicles, freight applications, and big data. Upon additional follow-up conversation and consideration, these technologies were organized into the following three technology packages for further business case development.

- Urban Solutions
- Freight Solutions
- Rural Solutions

The research team will move forward into Phase IV of the project with initial work on the three technology packages and business cases indicated above. Following are examples of areas of initial research areas for each technology package.

- **Urban Solutions:** approaches to open interfaces and data sharing; technology solutions for public transport; future communication technologies and applications; location-based services; infrastructure management though connected, smart systems; integrated ticketing and electronic fare management, etc.
- **Freight Solutions:** technology-supportive ecosystems and management systems; mixed-mode interfacing; last-mile delivery solutions; autonomous freight platooning; shipment tracking and reporting; robotics and automation, etc.
- **Rural Solutions:** advanced pavement technologies; traveler information systems and real-time information; unsafe condition detection and notification; autonomous and connected vehicle safety applications; interagency information sharing, etc.