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TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Disruptive Technologies and the Future of the Transportation Agency

February 26, 2024

2:00 – 3:30 PM



PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.



AICP Credit Information

1.5 American Institute of Certified Planners Certification
Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your
credits

Contact AICP, not TRB, with questions

Purpose Statement

This webinar will examine the changing landscape along with new and potentially disruptive technologies in the transportation sector and evaluate their potential impacts on the performance of DOTs. Presenters will share steps to adopt new technologies and make necessary changes in processes and organization to adapt to these technologies.

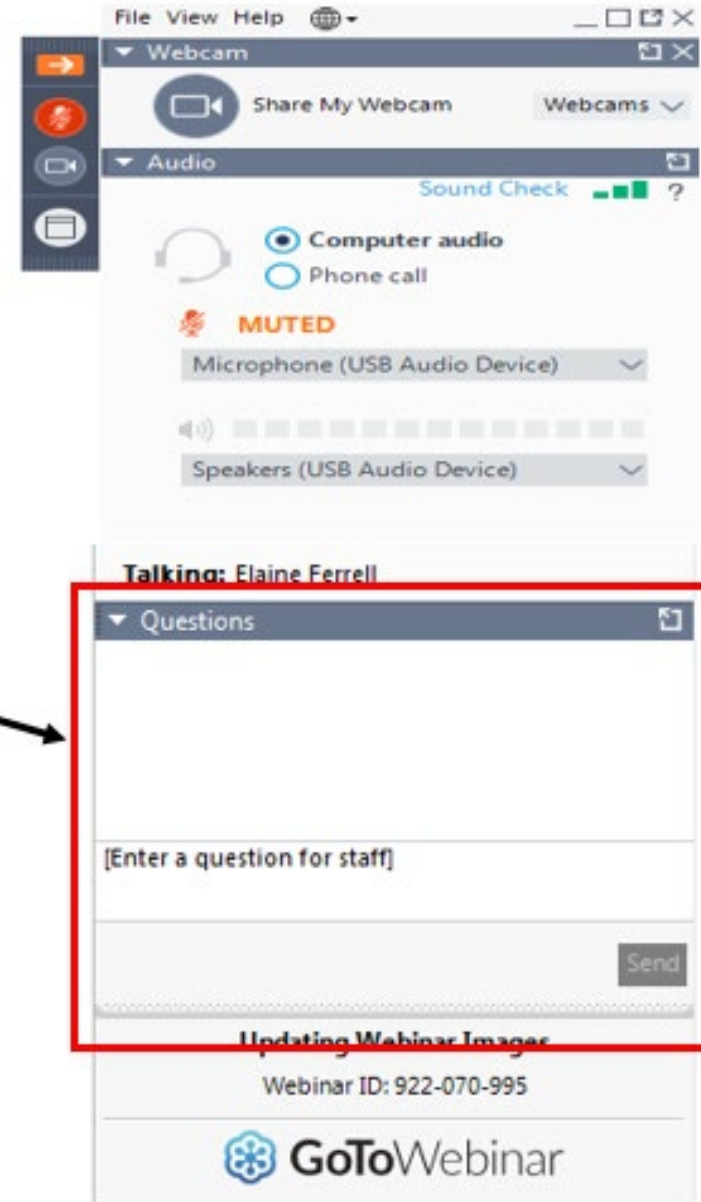
Learning Objectives

At the end of this webinar, you will be able to:

- Identify disruptive technologies and evaluate their impacts on DOT operations and administration
- Plan for and integrate disruptive technologies into processes and organizational frameworks

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters



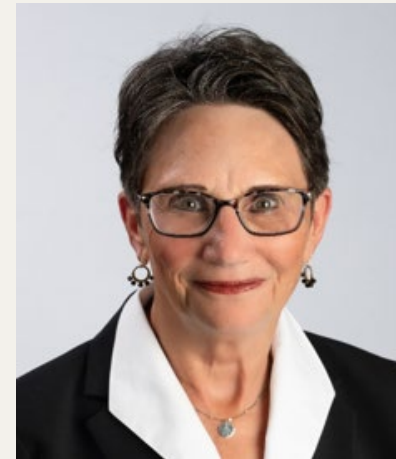
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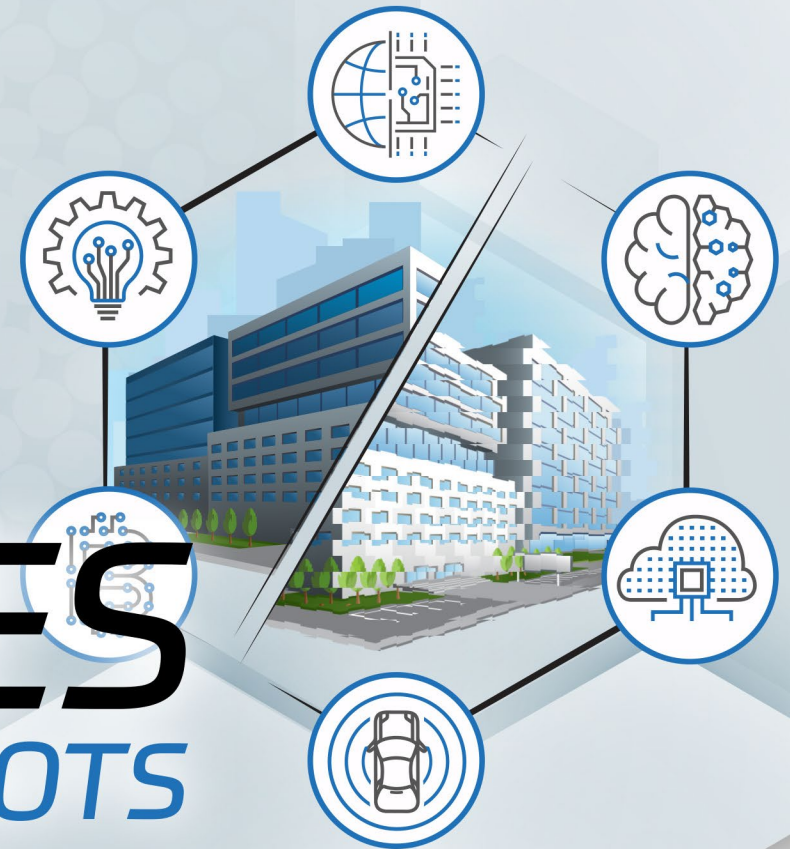


Deb Miller
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University of Kansas

NCHRP 08-127: IMPACT OF NEW
DISRUPTIVE
TECHNOLOGIES
ON THE PERFORMANCE OF DOTs

presented by

Baird Bream, Cambridge Systematics Senior
Associate – Planning & Management



February 26, 2024

AGENDA

- **Research Objective & Approach**
- **Defining Disruptive Technologies**
- **Playbook to Become a Tech-Savvy DOT**
- **Learning More**

RESEARCH OBJECTIVE

The objective of this research is to **develop a guide for state DOTs** and other transportation planning agencies to understand, predict, plan for, and adapt to the potential impacts of emerging disruptive technologies. In preparing this guide, the research should identify issues, effects, and opportunities at **the intersection of disruptive transportation technologies and organizational performance** for senior managers at state DOTs and other transportation planning agencies; and it should include but not be limited to the following components:

- **Categories** of technology disruptors
- New business opportunities or **partnerships** and collaboration models
- Impacts on **how agencies execute** planning and prioritize investments, implement, maintain, manage and operate the transportation system
- **Roles and responsibilities** of federal, state, regional, and local agencies
- Improving overall **customer service**
- The target **audience for this research is practitioners as well as decision-makers** at state DOTs and their transportation partner organizations

RESEARCH PANEL AND PROJECT TEAM

- Ms. **Caroline A. Mays**, AICP TxDOT - Chair
- Mr. **Christos Xenophonos**, RIDOT – AASHTO Monitor
- Mr. **Christopher Berrens**, MNDOT
- **Dr. Paul Carlson**, P.E. – Road Infrastructure, Inc.
- **Dr. Jan-Mou Li** – MWCOCG
- Mr. **J. Neil Mastin** – NCDOT
- Mr. **Henk Schuurman** – RWS
- **Dr. Shital Thekdi** – University of Richmond
- Ms. **Dara Wheeler** – Caltrans
- **Dr. Yao-Jan Wu**, P.E. – University of Arizona
- Mr. **James Gray** – FHWA Liaison
- **Dr. Matthew Hardy** – AASHTO Liaison
- Ms. **Jennifer Weeks** – NCHRP Staff
- **Cambridge Systematics** | Lead
- **University of Kansas** | Implementation
- **Steve Lockwood** | Guidance Options

RESEARCH APPROACH

- **Define and Categorize** | Technology, Disruption, Performance, DOTs
- **Prioritize** | What technologies are the most important to users? What performance is most important to measure?
- **Guide** | Provide DOTs with tools to
 - » *Identify* disruptive technology
 - Examples: big data, ACV, mapping, robots, workforce automation
 - » *Evaluate* internal/external impact on DOTs and customers
 - Example: Internal operational efficiency, safety for users, throughput capacity
 - » *Decide* on critical issues
 - Example: Is it a priority for investment?
 - » *Implement* change
 - Example: invest in new staff roles
- **Alignment** | Build on existing FHWA/AASHTO TPM framework and resources

DEFINING DISRUPTIVE TECHNOLOGIES

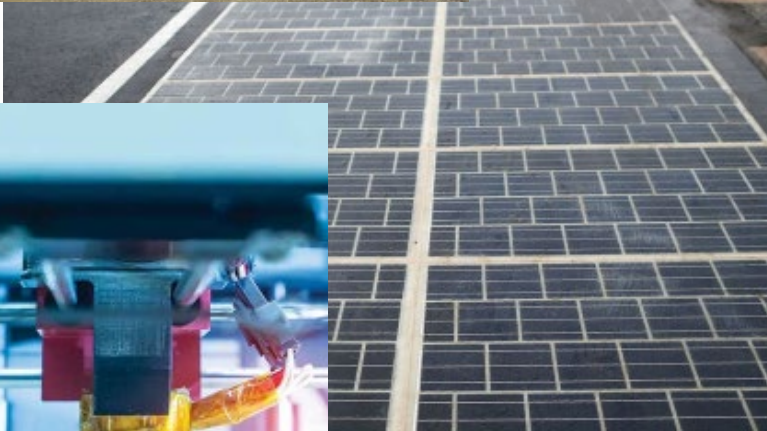
*Replaces or displaces a status quo technology, process, or product resulting in **changed behavior** and new and improved ways of doing or conducting business with **impacts** on people, stakeholders, and organizations.*

DEFINING DISRUPTIVE TECH

Technology could be considered disruptive if it has:

- **Use case:** one or more situations in which the technology addresses a need or provides a service more effectively than existing standards practices
 - » CAVs move long-haul freight more efficiently and more safely for carriers
- **Performance improvement:** capability to improve transportation system performance or the performance of a DOT
 - » CAVs improve overall system safety and efficiency
- **Business model:** A reliable and consistent process through which the technology is available to users
 - » Freight shippers sell truck space in CAVs in an online marketplace

DEFINING DISRUPTIVE TECH



- Disruptive technologies (DT) are typically **combinations of several individual core technologies** relating to sensors, communications, AI, or materials
- Example **external** DTs:
 - » New vehicle related systems
 - » Innovative service delivery methods
- Example **internal** DTs:
 - » Advanced analytics
 - » High-performance materials
 - » Innovative project delivery mechanisms

POSSIBLE DOTs OF THE FUTURE

Model	Focus	Priority Metric(s)	Commitment to Customers	Relationship to DTs
Department of System Management	Maintain existing system performance	Safety Reliability State of Good Repair	Ensure travel times are reliable and assets are safe	Adopt proven DTs for materials and system management
Department of Mobility	Meet customer preferences for travel and provide options	Safety Customer satisfaction	Look for solutions to make travel seamless	Adapt to emerging mobility choices with agile mgmt techniques
Department of Strategic Development	Build and maintain new service models via partnerships	Safety Social and economic benefits	Advance the public good	Convene partners to pursue, deploy, and evaluate DTs that catalyze community and economic dvlpmnt

PLAYBOOK



- Describes **incremental steps** agencies can take to incorporate disruptive technology into performance management system and supporting organizational structure
- Each step is supported by a series of actions, decision-making tools, and examples to help DOTs prepare for, identify, and implement DTs

PLAYBOOK



- Educate yourself and your team
- Join the national conversation
- Workshop the idea of your DOT becoming a tech-savvy DOT of the Future
- Use the workshop presentation to brief partners and develop partnerships

PLAYBOOK



- Understand the context for technology change
- Establish a direction for the future
- Link the vision to current plans and processes

PLAYBOOK



- Identify new potentially disruptive technology and their mechanisms of disruption
- Identify which disruptions are relevant to DOT objectives
- Track key technologies
- Determine the potential level of disruptiveness
- Prioritize technologies

PLAYBOOK



- Consider adjustments to organizational performance management framework
- Develop specific organizational performance management framework improvements
- Builds on established FHWA TPM toolbox and FHWA/AASHTO process

TPM TOOLBOX

TPM Toolbox

This website is the home of the FHWA Transportation Performance Management Toolbox.

[Learn more about the TPM Framework](#)



TPM Guidebook

The TPM Implementation Guidebook provides clear practical actionable steps that state DOT leadership, management, and staff can implement to enhance performance management practices.



Self-Assessment

The TPM self-assessment helps to determine your organization's level of performance management maturity. Your assessment results are linked directly to the guidebook and other resources on this site.



TPM Resources

The TPM Resources Library contains best practices, precedents, and other helpful resources. Browse the library or quickly navigate to a specific document using our search tools.



FHWA Generic Transportation Performance Management Components		Adapted to Accommodate Disruptive Technology
Process	Strategic direction and target setting (TPM steps 1 and 2)	Confirm agency objectives and performance measures (may need new measures for some DTs) Identify priority DTs
	Performance-based planning and programming—strategies and investments (TPM steps 3 and 4)	Identify external DT management strategies: <ul style="list-style-type: none"> Changes in standards New infrastructure Expanded DOT legal role authority Research and development (including pilot programs) Strategic investments New business processes/models Identify internal DT management strategies: <ul style="list-style-type: none"> Changes in standards New business processes/models New roles/responsibilities, organizational functions
	Monitoring and assessment (TPM step 5)	Establish and track DT-related performance management: <ul style="list-style-type: none"> Data collection and management Data analysis Data reporting
	Internal and external reporting and communication (TPM step 6)	Establish DT analysis and reporting systems
Organization	Organizational structure and culture (TPM step A)	Develop data usage plan
	Staffing (TPM step A)	Identify internal responsibility and relationships: <ul style="list-style-type: none"> For data collection For policy regulatory action
	External collaboration (public–public and public–private) (TPM step B)	Establish external DT-specific relationships for communications and cooperation: <ul style="list-style-type: none"> With other state agencies (regulatory) With producer/provider entities With other levels of government

PLAYBOOK



➤ Identify external and internal management strategies for disruptive technologies

Table 8 Sample Strategies

DOT Function	Near-Term Strategies	Long-Term Strategies
Performance	<ul style="list-style-type: none"> Relate agency objective performance measures to known DT Review performance measurement program to assess ability to track performance impacts Install new performance measures for specific DT impacts Revise performance reporting system to capture new DT metrics 	<ul style="list-style-type: none"> Track performance impacts in relation to DT progress indicators Incorporate performance impact program measures into planning process, data collection
Planning and Programming	<ul style="list-style-type: none"> Develop appropriate evaluation methods to determine DT potential Develop DT-specific program responses to performance impacts Evaluate DT-specific program impacts on budgeting 	<ul style="list-style-type: none"> Develop plan modifications and processes to accommodate budget changes Adjust design standards to accommodate DT operational impacts Conduct long-term needs assessment to program needed support infrastructure for DTs (e.g., EV charging stations for EV deployment)
Policy	<ul style="list-style-type: none"> Define use cases and points of control / ownership for DT Update DOT HR policies and procedures regarding tech testing and certification, licensing Evaluate incentive options to encourage positive DT deployment within DOT divisions / across DOT partners 	<ul style="list-style-type: none"> Update DOT IT policies and procedures regarding privacy, security, data, and IP ownership Update DOT standards to account for performance impacts of new tech (design, engineering, planning, etc.)
Procurement	<ul style="list-style-type: none"> Consider mechanisms to improve regular communication with DT vendors and service providers nationally Develop in-state relationships with vendors to maintain DT development and deployment awareness Evaluate pros and cons of outsourcing for DT-related expertise 	<ul style="list-style-type: none"> Establish new procurement and contracting approaches

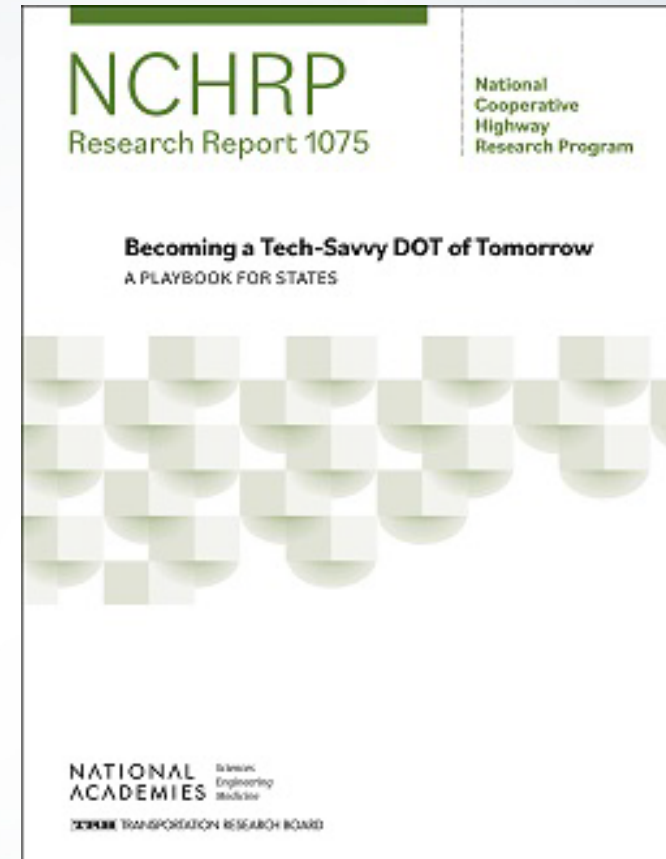
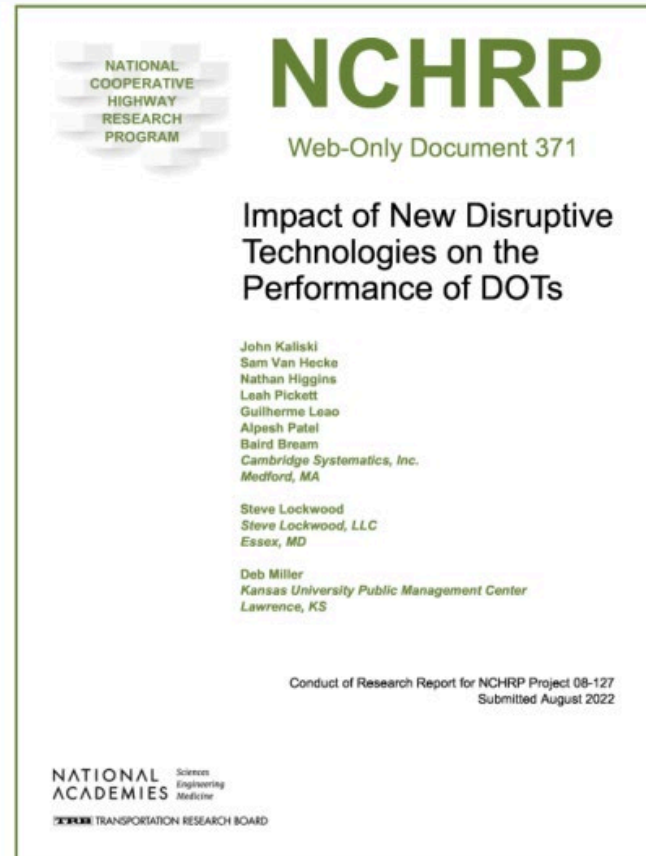
PLAYBOOK



- Plan the change message
- Implement change
- Train for new needs
- Manage on ongoing basis

LEARN MORE

NCHRP 08-127: IMPACT OF NEW
**DISRUPTIVE
TECHNOLOGIES**
ON THE PERFORMANCE OF DOTs



Available at:
<https://www.trb.org/Publications/Blurbs/183105.aspx>

Available at:
<https://www.trb.org/main/blurbs/183103.aspx>



Technical Committee 2.3: Freight

Emerging Freight Technologies

Caroline Mays, AICP

Director of Planning and Modal Programs, Texas Department of Transportation, USA

TRB Webinar: Disruptive Technologies and the Future of the Transportation Agency

February 26, 2024

OVERVIEW OF PIARC

- **PIARC = World Road Association**
- It was **founded in 1909** as a non-profit, non-political association
- **First global forum for the exchange of knowledge, policy and practice on roads and road transport**
- **140 member governments**, as well as regions, groups/companies and individuals
- Mobilizes the experience and knowledge of **1,600 experts** from more than 80 countries in **20+ Technical Committees and Task Forces**.
- Recognized for the quality and neutrality of its work
- Works with HICs as well as with LMICs

PIARC's FOUR KEY MISSIONS

- Be a **leading international forum for analysis and discussion** of the full spectrum of transport issues related to roads and related transport;
- Identify, develop, and disseminate **best practice** and **give better access to international information**;
- Consider within its activities the needs of **developing countries and countries in transition** fully; and
- Design, produce, and promote **efficient tools for decision making** on matters related to roads and related transport.
- The Association mobilizes the expertise of its members
- Through operations guided by a **4-year Strategic Plan**

TECHNICAL COMMITTEE 2.3: FREIGHT TRANSPORT

LEADERSHIP: Chair: Martin Ruesch (Switzerland); English Speaking Secretary: Tiffany Julien (USA); French Speaking Secretary: Bernard Jacob (France); Carlos Santillán Doherty (Mexico)

Working Group 1: Greening Freight Transport

- WG Co-Leaders: Else-Marie Marskar (Norway), Hinko van Geelan (Belgium)

Working Group 2: Overloading

- WG Co-Leaders: Olivier Quoy (France) & Bernard Jacob (France)

Working Group 3: Emerging Freight Transport Technologies

- WG Co-Leaders: Caroline Mays (USA) & Eiichi Taniguchi (Japan)

METHODOLOGY FOR REPORT DEVELOPMENT

FOUR STEP STRATEGY

In developing the PIARC Report “Emerging Freight Transport Technologies”, the T.C.2.3.3 Emerging Freight Technologies Working Group followed a comprehensive strategy that consisted of four steps:

1. Developed a short list of emerging freight technologies.
2. Conducted an extensive literature search and review of information on the short list of emerging freight technologies.
3. Developed a collection of 22 Emerging Freight Technologies Trends Fact Sheets.
4. Developed the Final Report. The chapters were developed by a core team of writers and reviewers, followed by compilation, editing, and a QA/QC process to finalize the report.



INNOVATIONS AND ADVANCES IN EMERGING TECHNOLOGIES

WORKING GROUP 2.3.3. - EMERGING FREIGHT TECHNOLOGIES

OUTLINE

1. DEFINITION OF EMERGING FREIGHT TECHNOLOGIES
2. OVERVIEW AND BENEFITS OF EMERGING FREIGHT TECHNOLOGIES
 - BASIC FREIGHT TECHNOLOGIES
 - FREIGHT VEHICLE TECHNOLOGIES
 - ALTERNATIVE MODES OF FREIGHT TECHNOLOGIES
 - AUTOMATED FREIGHT TECHNOLOGIES
 - FREIGHT TRANSPORT MANAGEMENT
3. KEY FINDINGS AND CONCLUSIONS
4. SUMMARY OF OVERALL BENEFITS OF EMERGING FREIGHT TECHNOLOGIES



DEFINITION OF EMERGING FREIGHT TECHNOLOGIES

A COLLECTIVE UNDERSTANDING - WORKING GROUP DEFINITION:

“Emerging technologies in freight transport and logistics” addresses the use of materials, tools, techniques and sources of power to make freight transport and logistics more efficient, reliable, environmentally friendly, safe and secure. Emerging technologies are technologies which are under development or recently implemented, or not yet fully implemented, or in testing phase or pilot applications.”

WHY IMPLEMENT EMERGING FREIGHT TRANSPORT TECHNOLOGIES?

Key reasons for implementing emerging technologies in the freight transport and logistics are to:

- **Increase capacity, efficiency and reliability**
- **Reduce greenhouse gas (GHG) emissions (decarbonisation)**
- **Mitigate environmental impacts**
- **Improve road safety**
- **Prepare for, and correspond to stricter legal requirements**
- **Address freight transport and logistics sector workforce shortage**

BASIC FREIGHT TECHNOLOGIES BENEFITS AND IMPACTS



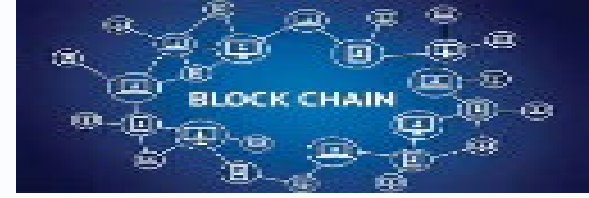
ARTIFICIAL INTELLIGENCE

- Improve safety
- Reduce greenhouse gas emissions
- Reduce costs and efforts
- Better logistics management
- Energy savings



PHYSICAL INTERNET

- Reduce logistics cost
- Provide reliable and better services to customers
- Reduce GHG emissions
- Reduce distance travelled
- Increase resilience



BLOCKCHAIN

- Improve communication
- Real-time traceability
- Smart contracts
- Reduce empty truckloads

FREIGHT VEHICLE TECHNOLOGIES BENEFITS AND IMPACTS



Battery Electric Trucks and Vans

- Lower maintenance costs
- Lower environmental impacts



Biofuel Vehicles

- Reduce freight transport Carbon emissions
- Lower costs



Electric Cargo Bikes

- Space-efficient and eco-friendly alternative for freight transport
- Lower environmental impacts



Heavy and Longer Trucks

- Greater productivity
- Improve safety
- Minimize impacts on the environment and road infrastructure

ALTERNATIVE MODES OF FREIGHT TECHNOLOGIES BENEFITS/IMPACTS



Autonomous Delivery Robots

- Solution for the last-mile delivery of goods
- Reduce congestion in urban areas
- E-commerce growth



Underground Freight

- Environmentally friendly vehicles (last-mile)
- Reduction of traffic congestion and noise emissions



Air Freight Transport

Air Drones/Air Ships

- Greener faster
- Address infrastructure capacity challenges roads, seaports, and airports

ALTERNATIVE MODES OF FREIGHT TECHNOLOGIES BENEFITS/IMPACTS

DRONE DELIVERY

- Drone delivery underway in 27 Countries
- 13 Countries pioneering medical supplies delivery
- ❖ E-commerce Growth
- ❖ Last mile delivery
 - ❖ By-pass traffic congestion
- ❖ Save money on transportation and shipping costs
- ❖ Reduce costs for consumers
- ❖ Quicker and reliable service for consumers
- ❖ Support underserved and remote communities
 - ❖ Medical supplies
 - ❖ Emergency response



AUTOMATED FREIGHT TRANSPORT TECHNOLOGIES BENEFITS/IMPACTS



AUTONOMOUS TRUCKS



TRUCK PLATOONING

- **Improve road safety**
- **Address labor shortage challenges**
- **Increase reliability and efficiency**
- **Improve productivity**
- **Reduce fuel consumption and operational costs**
- **Improve economic competitiveness**

FREIGHT TRANSPORT MANAGEMENT TECHNOLOGIES BENEFITS/IMPACTS

INTERNATIONAL BORDER CROSSING MANAGEMENT

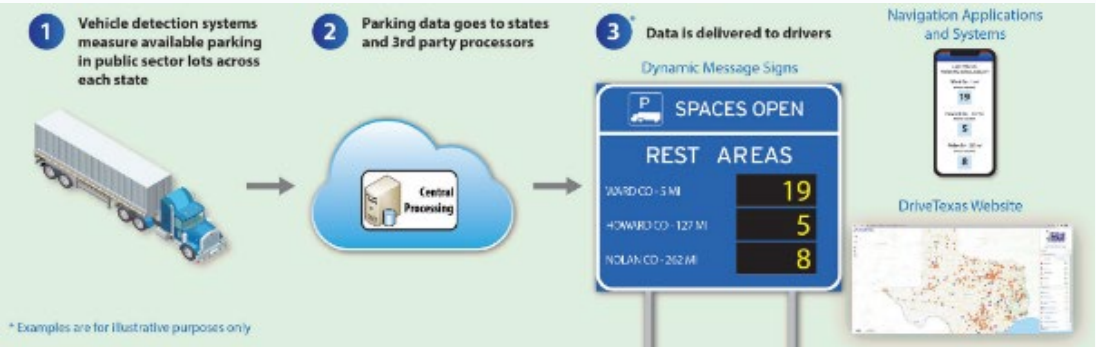
- Facilitates more efficient international border-crossing process
- Provides a systematic and consistent measurement of border-crossing and wait times
- WIM provides critical safety information that allows inspectors to target violators and expedite crossings for weight-complying commercial vehicles
- Smarter border crossing that provides efficient, secure, and safe service to all users.



FREIGHT TRANSPORT MANAGEMENT TECHNOLOGIES BENEFITS/IMPACTS

TRUCK PARKING MANAGEMENT

- Identify the number of open parking spaces
- Inform drivers where there is available and authorised parking
- Minimise parking at unauthorised locations like shoulders and ramps
- Reduce the time spent searching for parking
- Improve safety for drivers and the travelling public



SUMMARY OF OVERALL BENEFITS OF EMERGING FREIGHT TECHNOLOGIES



Safety: Significantly reduce accidents, injuries, deaths.



Congestion: We can't keep building new roads. Potential capacity increase.



Emissions: Harmonisation of flow, reduced stops, closer following distances.



Time: What could/would you do if you didn't have to drive?



Equity: Technology could enable all to have greater mobility.



Roadway cost: Could reduce needs for some infrastructure such as signs and crash barriers.

KEY FINDINGS AND CONCLUSIONS

- Emerging freight technology is not understood by everyone in the same way
- Emerging technologies are still concept phase of adoption and implementation in the freight transport sector, while others are already being applied in the market
- Emerging technologies have a great potential to make freight transport greener, smarter, safer, and more sustainable
- Focus on evaluations and benchmarking of emerging freight technologies
- Learning from less good examples is as important as learning from good examples

RECOMMENDATIONS

T.C.2.3.3. WORKING GROUP RECOMMENDATIONS FOR DECISIONMAKERS

1. Develop a Vision and Framework to Support Adoption of Innovative Freight Technologies
2. Implement and Participate in Case Studies/Pilot Projects
3. Document and Disseminate Findings of Case Studies/Pilot Projects
4. Continuous Monitoring and Technology Transfer Through Peer Exchanges
5. Conduct Follow-Up Study(ies) of Emerging Technologies Applicable to the Freight and Logistics Sector
6. Conduct a Freight Technology Readiness Assessment for Low and Middle Income Countries



EMERGING FREIGHT TECHNOLOGIES- DELIVERABLES



Website: www.piarc.org





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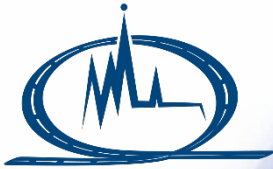
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 FACEBOOK.COM/TXDOT





**XXVIITH WORLD
ROAD CONGRESS
PRAGUE 2023**



THE ROLE OF TRANSPORT AGENCIES IN SHAPING DISRUPTIVE TRANSPORT TECHNOLOGIES AND SERVICE MODELS

**CHRISTOS XENOPHONTOS, PIARC TC 1.1 CHAIR
ASSISTANT DIRECTOR FOR ADMIN. SERVICES
RHODE ISLAND DOT**

**JONATHAN SPEAR, WG-LEADER
TRANSPORT POLICY AND STRATEGY ADVISOR
ATKINS RÉALIS**

**ANNE-SÉVERINE POUPELEER, WG-LEADER
FLANDERS AGENCY FOR ROADS AND TRAFFIC
BELGIUM**

**NATE HIGGINS
SLALOM**

AGENDA OVERVIEW

- What is PIARC
- TC 1.1 Terms of Reference
- Approach
- Literature Review Findings
- Survey Questionnaire
- Case Study Analysis
- What's Next

The Transport Agency of the Future has emerged as a theme from discussions within the current TC 1.1 in the 2020 – 2023 PIARC Strategic Planning Cycle mainly under considerations of responding to and shaping Disruptive Transport Technologies. This theme is being widened in the 2024 – 2027 Strategic Planning Cycle to cover broader drivers of change, future mission, public value creation, workforce planning and purpose and models of organisation design.

What is PIARC?

- **PIARC = World Road Association**
- It was **founded in 1909** as a non-profit, non-political association
- **First global forum for the exchange of knowledge, policy and practice on roads and road transport**
- **126 member governments**, as well as regions, groups/companies and individuals
- Mobilizes the experience and knowledge of **1,200 experts** from more than 80 countries in **20+ Technical Committees and Task Forces**.
- Recognized for the quality and neutrality of its work
- Works with HICs as well as with LMICs

Knowledge exchange: The core of PIARC

- **PIARC mobilizes international road and transport experts through more than 20 Committees:**
 - Ad-hoc dialogue among peers
 - Network building
 - Joint work towards commonly-agreed deliverables
- **These deliverables are widely accessible:**
 - Hundreds of Reports, Case studies, Literature reviews, etc.
 - Seminars or workshops
 - 5 comprehensive manuals (online)
 - Software and tools (HDM-4, QRAM)
 - Usually in English, French and Spanish. Usually free of charge.
- **PIARC Congresses and events are world-class focus points for:**
 - Dissemination of these deliverables
 - Further discussions and debate



TC 1.1 PERFORMANCE OF TRANSPORT ADMINISTRATIONS

Working Group 1: Understanding how Road and Transport Administrations are measuring the efficiency and effectiveness of Customer Experience and Public Value Creation

- WG Co-Leaders: Alan COLEGATE (Australia), Ilaria COPPA (Italy) & Deanna BELDEN (USA)

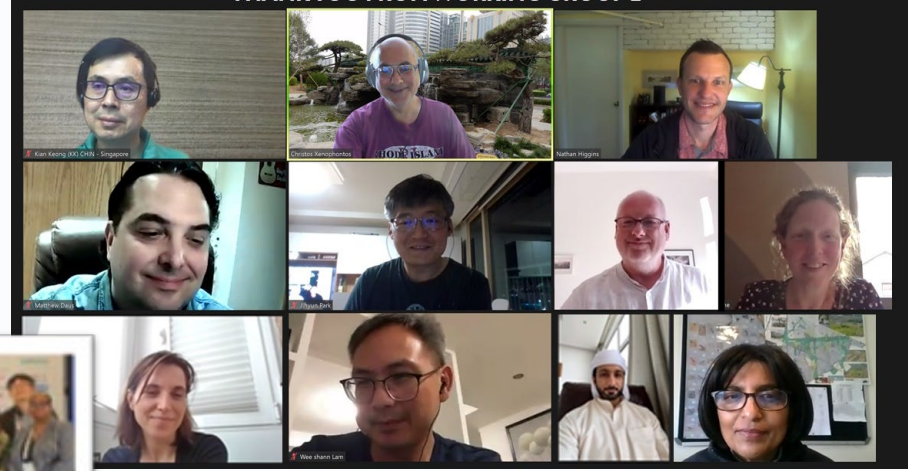
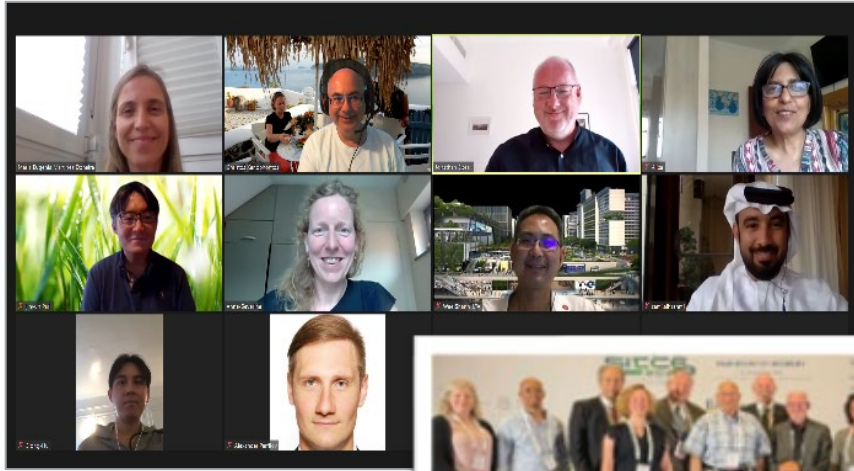
Working Group 2: The Role of Transport Agencies in Shaping Disruptive Technology and Service Models

- WG Co-Leaders: Jonathan SPEAR (UK) & Anne-S everine POUPELEER (Belgium)

Working Group 3: Organization of Staff and Human Resources

- WG Co-Leaders: Anna WILDT-PERSSON (Sweden) & Alex WALCHER (Austria)

TC 1.1 WORKING GROUP 2





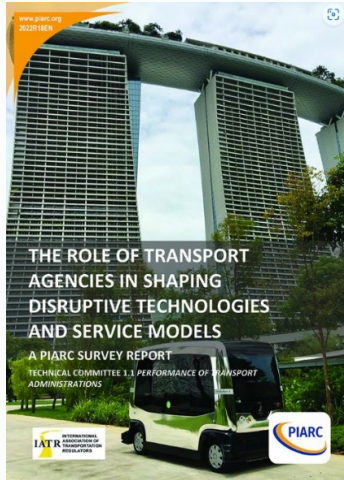
APPROACH

- Between 2020 and 2023 PIARC's TC 1.1 conducted **an extensive investigation** of key questions and research issues relating to **disruptive technologies and service models** impacting the roads and transport sector, **and how transport agencies are responding**, using a range of data collection and analytical methods, was accomplished.

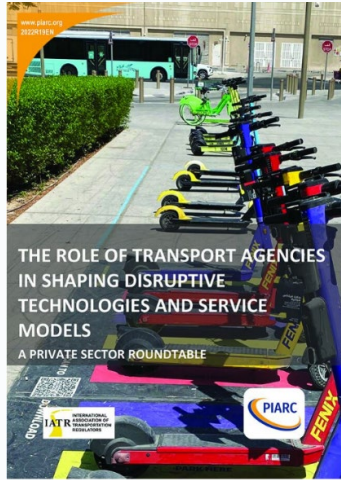
APPROACH

- 2020 – 2023 Activities
 - Development of **key terminology and definitions**
 - In-depth **literature review**
 - A global **survey questionnaire** of transport organizations
 - **A Private Sector Roundtable** organized jointly with IATR
 - Analysis of **12 detailed Case Studies** of policies and practices of specific transport agencies with support from Nathan Higgins (SLALOM)
 - Development of key **concepts and frameworks**
 - **Conclusions and recommendations** for transport agencies and for PIARC
 - On-going publication of a number of reports

WORKING GROUP 2 - PUBLICATIONS



[The Role of Transport Agencies in Shaping Disruptive Technologies and Service Models - Survey Report](#) (report 2022R18EN)



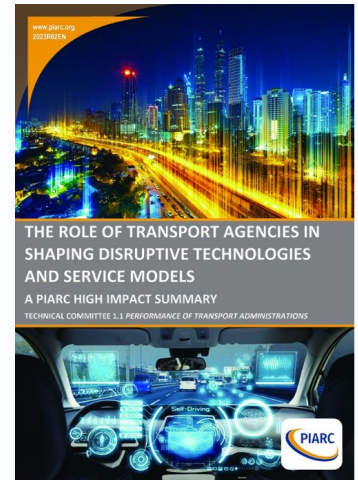
[The Role of Transport Agencies in Shaping Disruptive Technologies and Service Models - A Private Sector Roundtable](#) (report 2022R19EN)



[The Role of Transport Agencies in Shaping Disruptive Technologies and Service Models - Case Study Analysis](#) (report 2022R27EN)



[The Role of Transport Agencies in Shaping Disruptive Technologies and Service Models - Technical Report](#) (report 2023R01EN)



[The Role of Transport Agencies in Shaping Disruptive Technologies and Service Models - High Impact Summary](#) (report 2023R02EN)

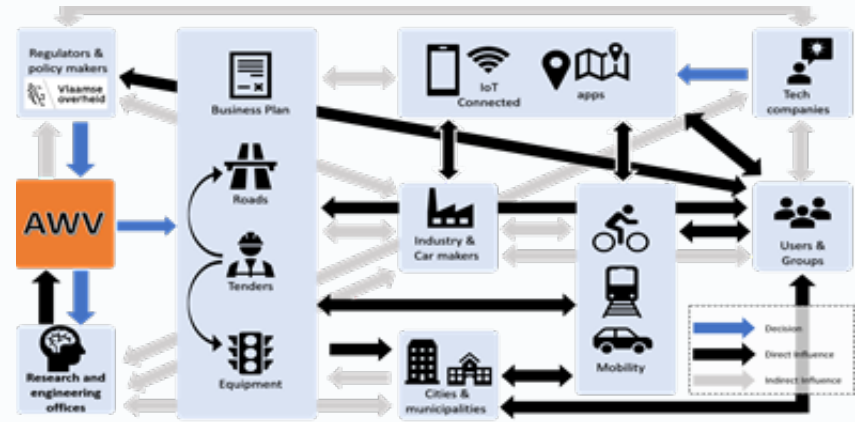
EXTENSIVE LITERATURE REVIEW

- **Disruptive Technologies and Service Models** are rapidly changing the transport sector,
 - with potentially multiple and complex impacts,
 - a need to respond in policy and regulatory terms,
 - but great uncertainty



LITERATURE REVIEW FINDINGS

- **A Future Mobility Ecosystem** is emerging, representing a **combination of new technologies, systems, infrastructure, data, and service propositions** converging to offer
 - **Integrated, automated, personalised and sustainable mobility** for people and goods



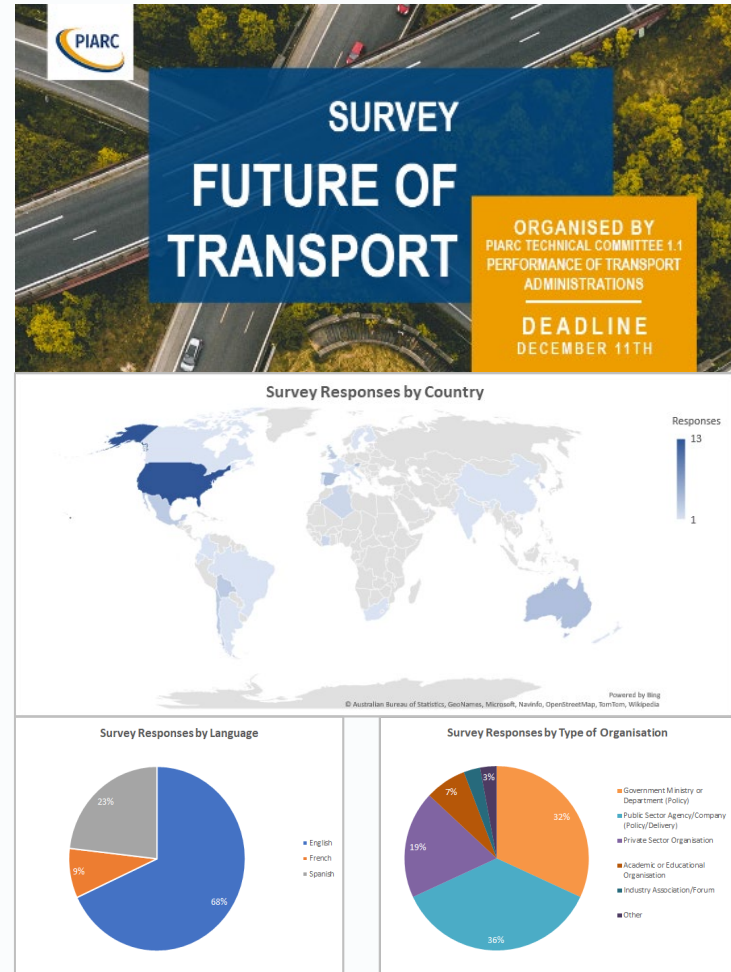
LITERATURE REVIEW FINDINGS

- This Ecosystem is **radically different** from, and looks to transform, physical infrastructure and transport services seen during the 20th Century, presenting major challenges for policy makers, and prompting a range of strategic and tactical responses
- Public agencies are responding in a variety of ways – from proactive innovation to resistance, delay or wait and see
- There is a need to define benchmarks and put **policy, regulatory, governance and organisational arrangements** in place to allow agencies to make informed and proportionate decisions relative to the pace and direction of change

SURVEY QUESTIONNAIRE

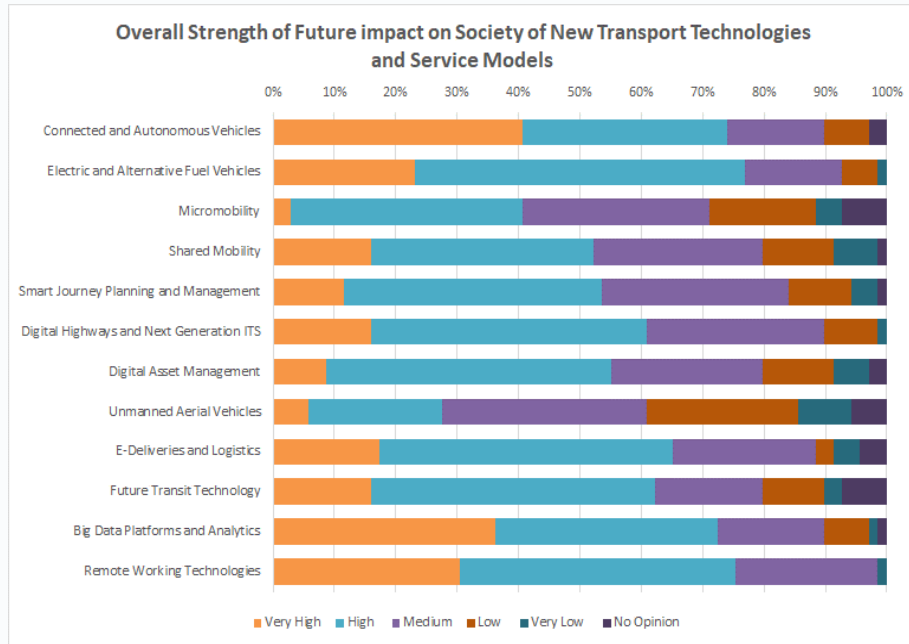
- Online questionnaire format via Survey Monkey to identify:
 - Most significant transport and mobility technologies, models and their impacts
 - Level and form of awareness and leadership around technology/innovation
 - Transport agencies' preparedness and responses (e.g., policies, structures, skills)
 - Most relevant partnerships and collaborations
 - Requirement for support tools and techniques
- Disseminated worldwide via PIARC, AASHTO, IATR, IRF, CHTS
- **69 full plus 16 partial responses!**

13



SURVEY FINDINGS

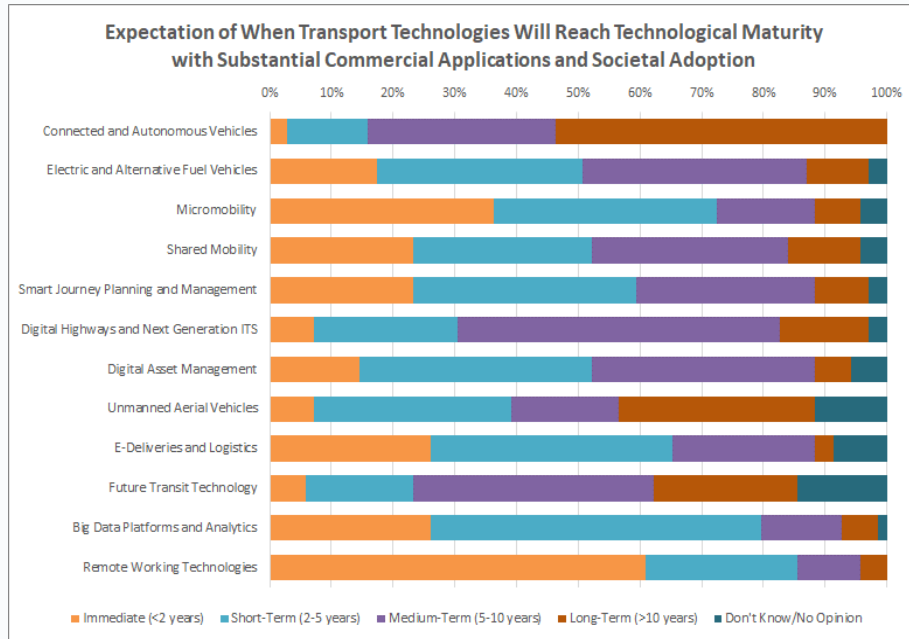
STRENGTH OF IMPACT ON SOCIETY



- New technologies and service models seen as having a high future impact, but impact of different technologies varies
- Top technologies for High/Very Impact are:
 - Electric Vehicles/Alternative Fuels (77%)
 - Connected & Autonomous Vehicles (74%)
 - Remote Working Technologies (75%)
- Technologies seen as Low/Very Low Impact:
 - Unmanned Aerial Vehicles (33%)
 - Micromobility (22%)
- Impacts generally seen as positive, but issues of claims/rhetoric vs future reality

SURVEY FINDINGS

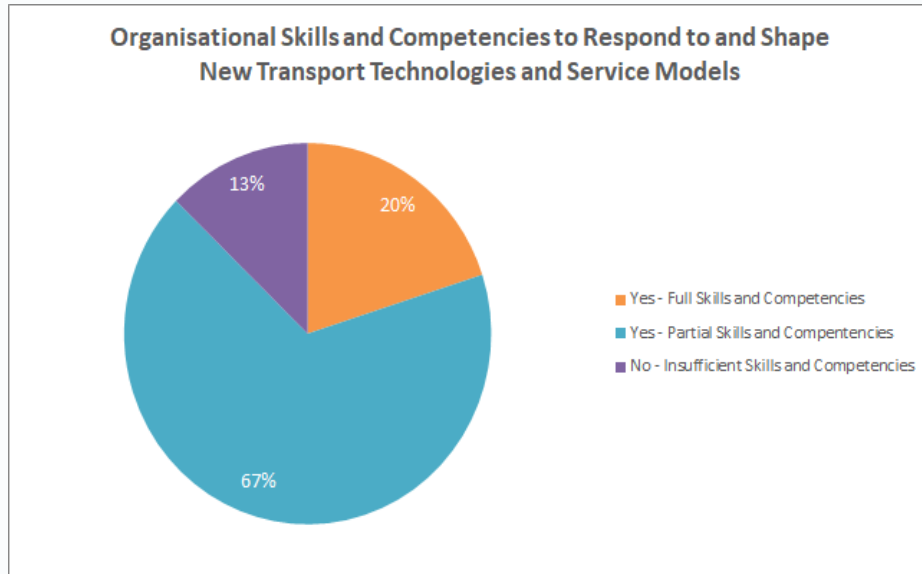
TIME TO MATURITY AND ADOPTION



- Considerable variation in timescales over which new technologies will mature and see substantial adoption
- Some technologies reaching this point in immediate and short-term – 5 years:
 - Remote Working Technologies (86%)
 - Data Platforms and Analytics (80%)
 - Micromobility (72%)
- Other technologies seen as longer-term:
 - Connected & Autonomous Vehicles (54%)
 - Unmanned Aerial Vehicles (32%)
 - Future Transit Technology (23%)
- Road vehicles seen as electric before autonomous – 87% vs 46% in 10 years

SURVEY FINDINGS

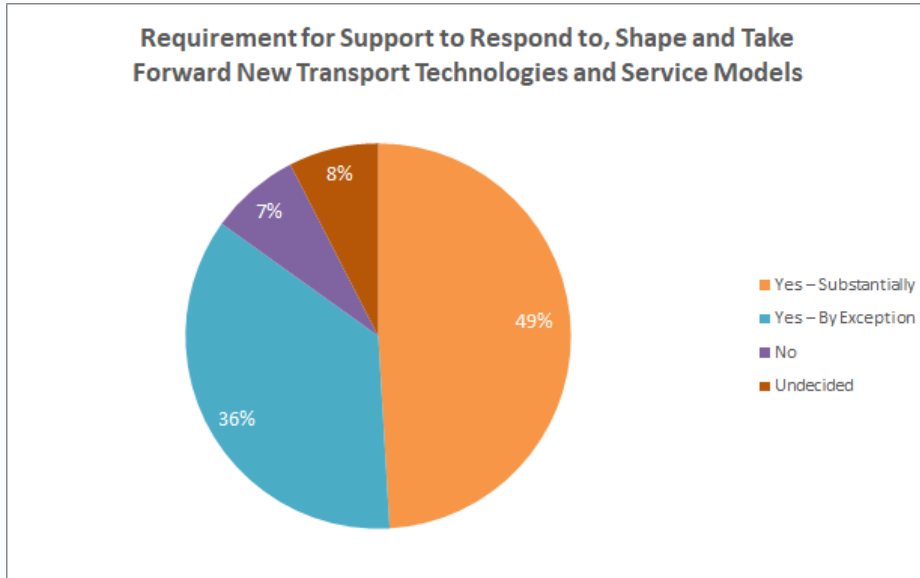
ORGANIZATIONAL SKILLS AND COMPETENCIES



- One fifth of organizations say they are fully equipped to respond to new technologies
- However, most organizations (80%) also need additional skills in some areas to raise preparedness
- A number of organizations note they do not have all skills needed, but have/will acquire them through:
 - Collaboration with academia and industry
 - Employing/seconding consultants or other external providers

SURVEY FINDINGS

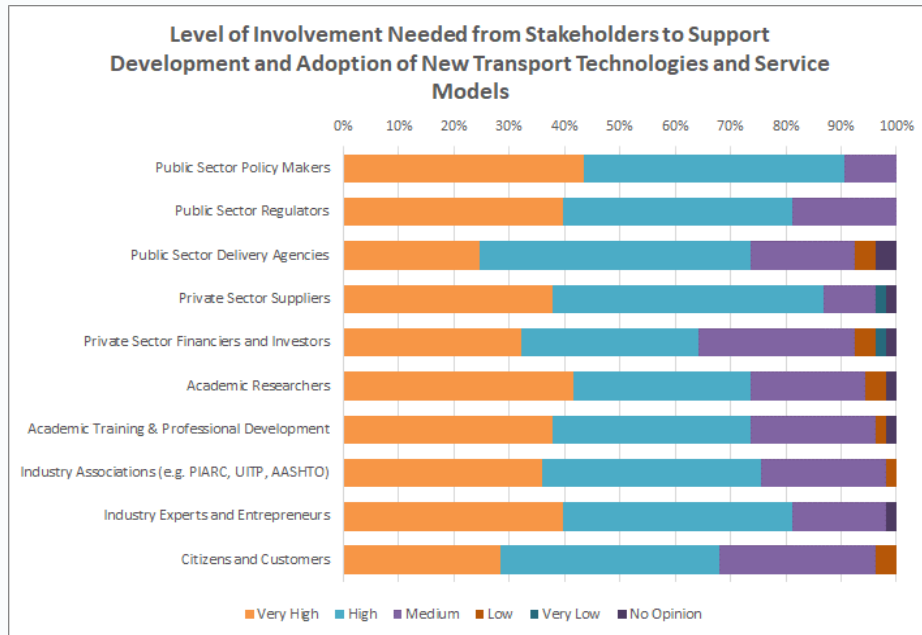
LEVEL OF SUPPORT REQUIRED



- Almost half (49%) of responding organizations feel they need substantial support
- A further third (36%) require support in a few areas and by exception
- Therefore 85% of organizations feel they need some form of assistance moving forward
- Only 7% feel they require no support moving forward, although 8% are undecided

SURVEY FINDINGS

LEVEL OF STAKEHOLDER INVOLVEMENT NEEDED



- The development new transport technologies and service models will need strong involvement from a wide range of stakeholders
- The highest and very highest level of involvement is needed from:
 - Public Sector Policy Makers (91%)
 - Private Sector Suppliers (87%)
 - Public Sector Regulators (81%)
 - Industry Experts and Entrepreneurs (81%)
- Successful delivery of new technologies will require collaboration between the public and private sectors (with appropriate regulation)

DETAILED CASE STUDIES



What did we gather?

- **Basic organizational information**
- New transport **technologies and service models** of most interest and **scope** for the organization
- Overall organizational **approaches to innovation** and technological change
- Concern and interest in **priority technologies**
- **Activities undertaken** to respond to and take new technologies forward

What did we gather?

- Specific **research, prototyping, testing and early deployment** activities
- Adaptations to **organizational structures and processes**
- **Partnerships** with external bodies, including private sector and academia
- Concern and interest in **priority technologies**
- Views on the **organization in 10 – 15 years' time** and longer-term term vision

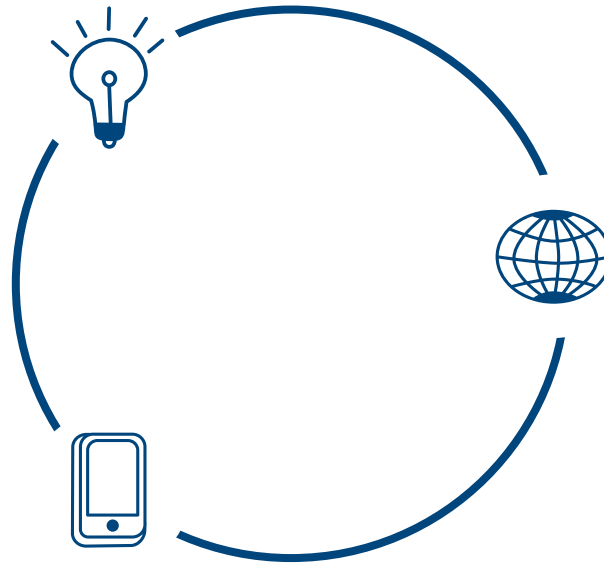
Highlights | Technologies and Service Models of Interest

Top Technologies

CAVs, EVs, digital asset management, digital highway/next gen ITS, and data platforms and analytics.

Remote Work

Consistently managed at the agency level, including as a response to the COVID-19 pandemic.



Less Focus

Micromobility, Urban Air Mobility and future transit systems are given relatively less focus at this time, either because of a lower level of technological maturity or being outside the remit of organizations focused predominantly on road infrastructure and services. Generally, not included in national road or transport agencies' remit or responsibilities.

Case Study Findings

- Technologies and **new service concepts** are advancing
- To scale innovation, agencies need to maintain a **strong learning mindset**
- **Partnerships, governance, and standards** are critical learning mindset
- **Stakeholders and end-users** are critical: Innovation requires trial and error, and takes time



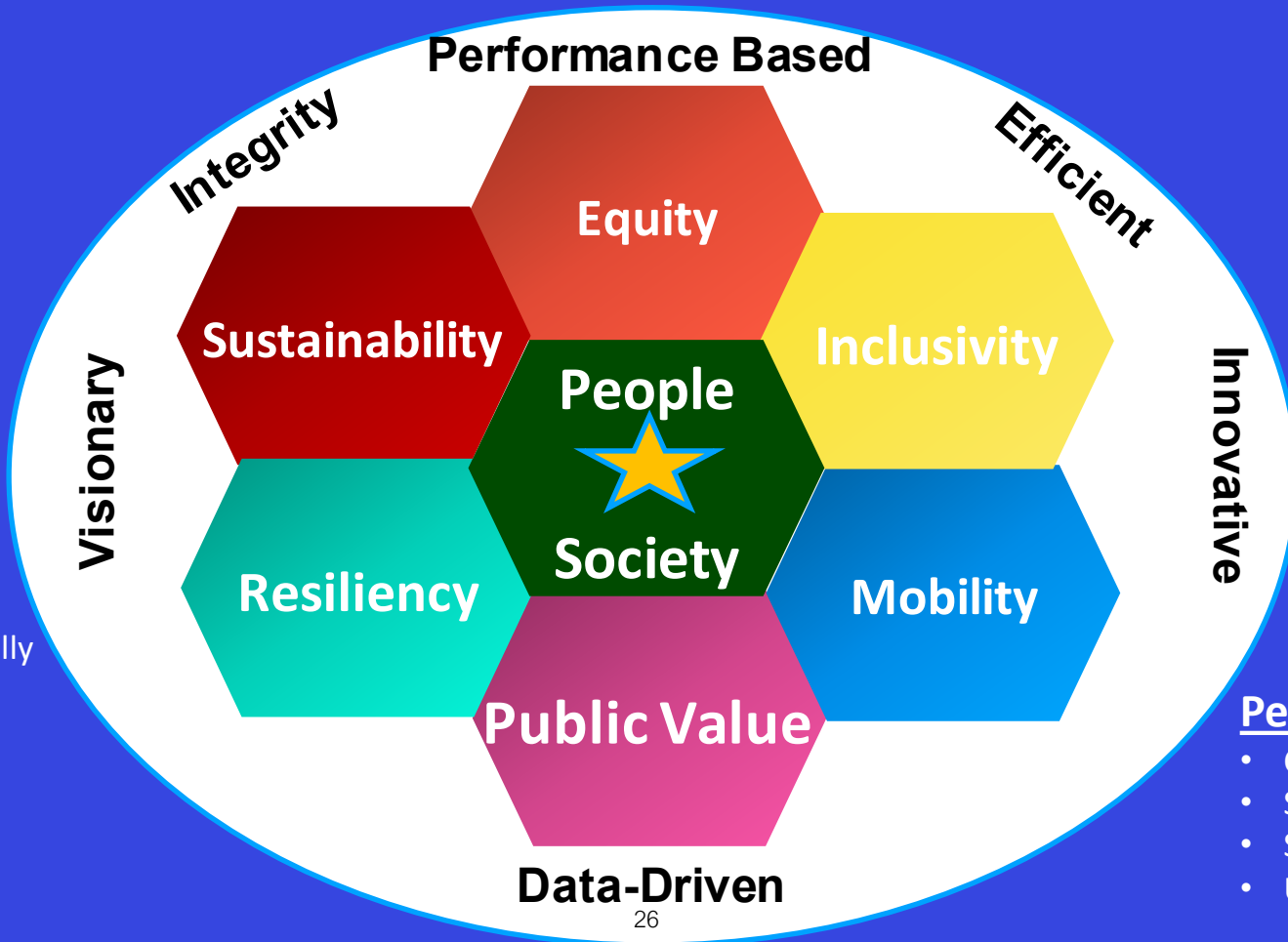
Case Study Findings

- **Communication** (and a strong business case) is a key ingredient to sustainable innovation
- Innovation should be **supported from the top management**, based on a strong business case
- The organization **needs to change** to enable innovation
- **Only some technologies** are entering the mainstream in the near term



TC 1.1 WHAT'S NEXT

STRATEGIC FRAMEWORK FOR THE TRANSPORT AGENCY OF THE FUTURE



Need a Home:

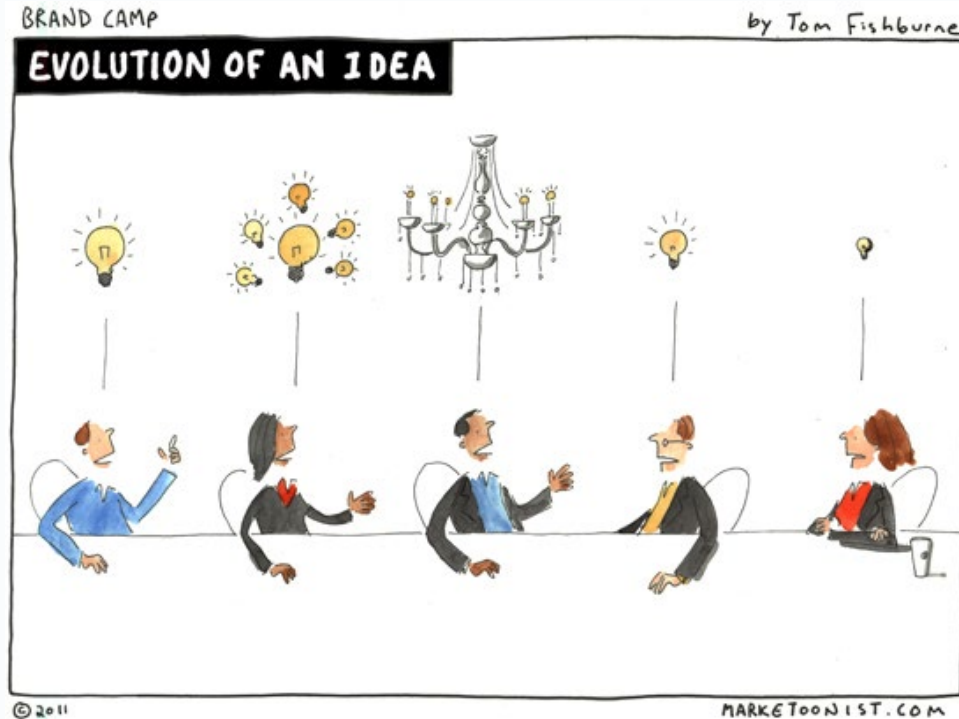
- Environmentally Sensitive
- Long-Term Thinking
- Safety Driven
- Stewardship
- Transparency

People:

- Customers
- Staff
- Stakeholders
- Users

TS11 – PERFORMANCE OF TRANSPORT ADMINISTRATIONS

WHAT'S NEXT



A NORTH STAR FOR GUIDING THE FUTURE OF TRANSPORT AGENCIES

INPUTS

(Constraints, Opportunities, STEEP, SWOT)

Political Direction
Vision and Purpose
Authority and Mandate
Data and Information
Finance and Resources
History and Legacy
Culture and Values

GUIDING PRINCIPLES

(Regulating Chosen Operating Model and Key Organisational Components)



OUTCOMES

(Economic, Efficient, Effective, Equitable)

People

- Customers
- Employees
- Stakeholders
- Community

Prosperity

Planet

Policy, Strategy, Planning, Design, Delivery, Regulation, Operations, Monitoring, Performance Management

TC 1.1 2024-2027 TERMS OF REFERENCE

ISSUE 1.1.1. THE TRANSPORT AGENCY OF THE FUTURE

Investigate how the transport agency of the future **must evolve to meet the changing customer needs.**

How to **leverage technology and innovation**, with highlights on different important aspects such as, role and function, changing and evolving business and operating models, **addressing issues of equity, diversity, and inclusivity**, addressing uncertainty, the impact of digitalization, including that of Artificial Intelligence (AI), and incorporating innovation at the organizational level to become an efficient and high-performing agency.

How to enable **effective engagement and dialog** with the evolving stakeholder ecosystem and how to work with other public and private entities to carry out this mission.

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Upcoming events for you

February 29

TRB Webinar: Emerging Technology,
Tools, and Practices to Address Impaired
Driving

November 7-8

Advancing Additive Manufacturing
and Construction in Transportation



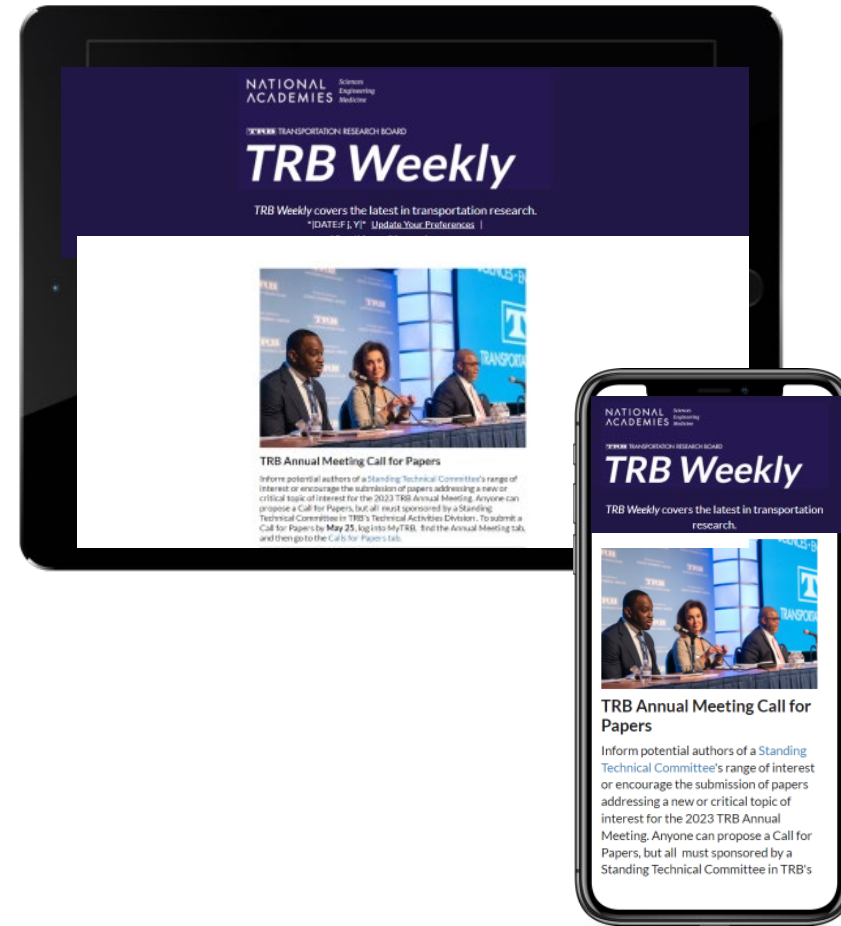
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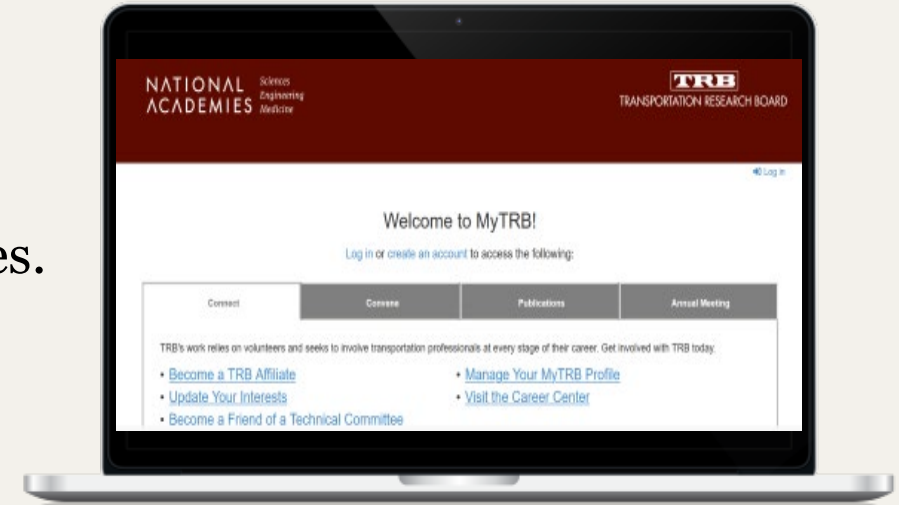
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