Keynote

Tarrant County Transportation Summit

RASHEQ ZARIF

DELOITTE FUTURE OF MOBILITY

Let's look at the evolution of human mobility

On foot

Domesticated animal power

With mechanical leverage

Materials innovations

Engineering as a discipline

ICE + wagon = motor Car

Airplanes

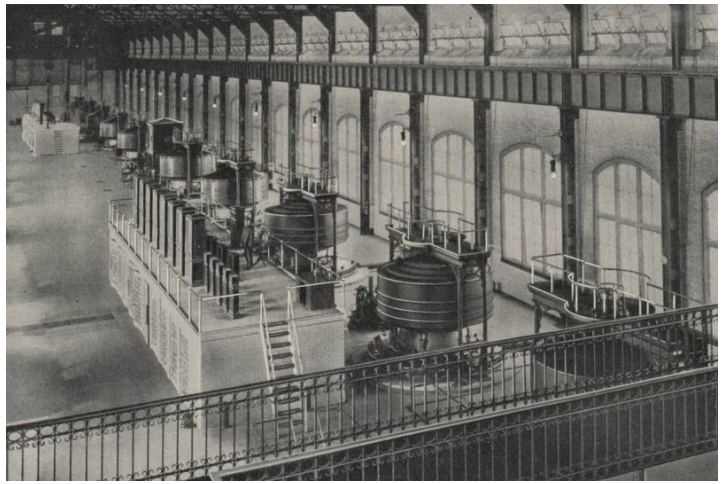
What will be the next major technology shift?

The pace of change has increased dramatically over the last century

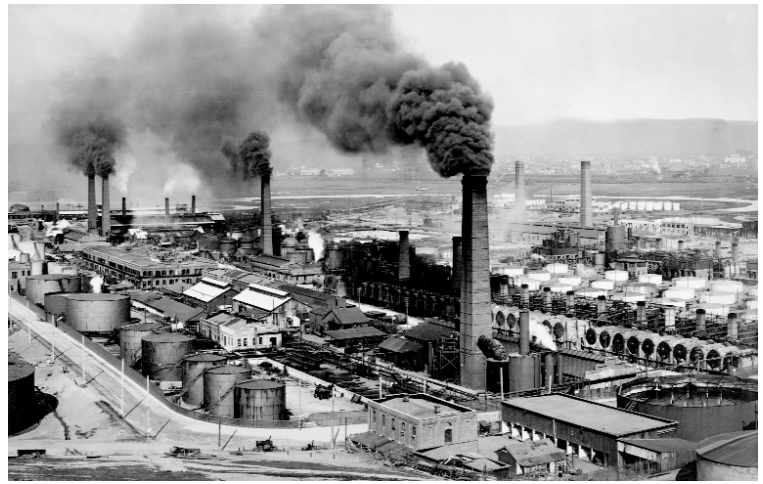
Source: Tony Seba, tonyseba.com, 2014

Just imagine: what it would have been like to have lived in the days of Ford, Edison and Rockefeller?

The Automobile



Electricity



Oil Refinery

Their inventions led to huge (not just incremental) shifts and convergences

Source: Tony Seba, tonyseba.com, 2014

Fifth Avenue in NYC – Can You Name the Years?

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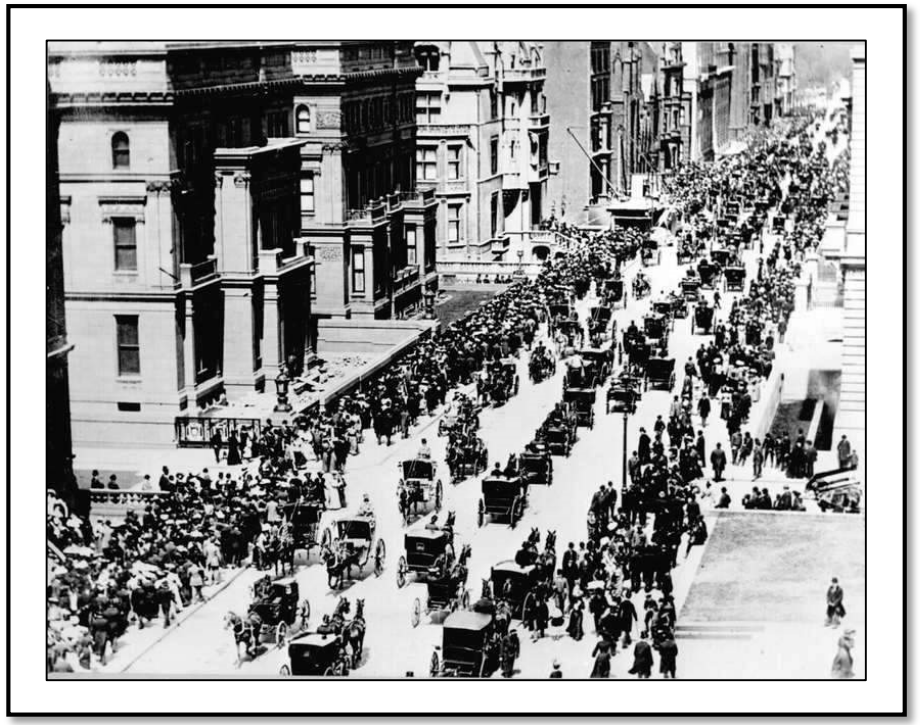

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Source: Tony Seba, tonyseba.com, 2014

Global Mobility Revolution – rapidly accelerating velocity of change

Global mobility is learning towards innovation and partnerships amidst the economic and regulation uncertainties

The Dallas Morning News
Dallas-based ride-hailing company Alto raises $6 million to expand in Dallas, start driving in two new cities

MARKETS INSIDER
The auto industry is shrinking as the world reaches 'peak car' — and it's dragging down the entire global economy

FT FINANCIAL TIMES
Decline of motor industry drives global economic slowdown

electrek
Self-driving trucks hauling USPS mail between Phoenix and Dallas

VB
Waymo expands autonomous truck testing to Texas and New Mexico

Newsroom
Volkswagen and Northvolt form joint venture for battery production

TC
Toyota leads $50 million investment in autonomous shuttle startup May Mobility

TC
GM, LG Chem to invest $2.3 billion in EV battery joint venture

THE HILL
Wheels begin to turn on self-driving car legislation

WRAL TechWire
Charlotte mobility tech startup Passport raises $65M, plans transportation 'ecosystem'

SMARTCITIESDIVE
Shell calls for transit 'revolution,' invests in mobile ticketing platform

TC
Lyft deploys 200 long-range EVs for its rideshare rental fleet in Colorado

The Washington Post
N.Y. ride-hailing drivers file suit against Uber, allege they are owed millions in undercut wages

SILICON VALLEY BUSINESS JOURNAL
Boeing, Kitty Hawk reorganize and rebrand Mountain View 'flying car' venture

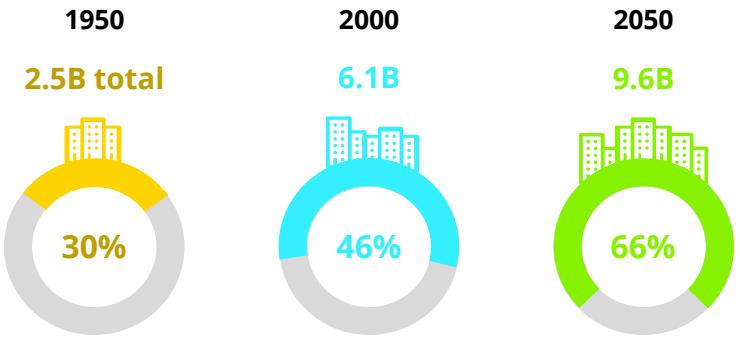
SAN DIEGO
Uber Eats Says Food Delivery by Drone is Coming to San Diego Next Summer

CNBC
Watch out, UPS. Morgan Stanley estimates Amazon is already delivering half of its packages

yahoo! finance
Lyft Introduces Rental Car Service In California

Cities around the world are straining to keep pace with rapid urbanization and population growth

Global Population Relative Urbanization (%)

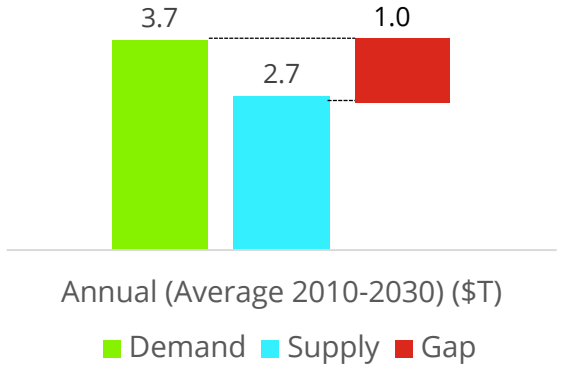


500 cities with populations over 1 million now exist around the world

41 mega-cities with populations over 10 million are expected by 2030

3.4B additional residents will be living in cities by the middle of the century

Shortfalls in Global Infrastructure Investments

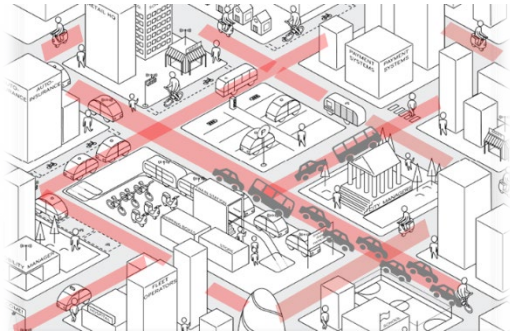


$1.2T could be lost in GDP* by 2025 due to transportation infrastructure deficiencies

73% of the metropolitan workforce commute for 90 minutes or more

30% of traffic in urban areas is caused by cars looking for parking

Implications for Future Urban Areas in the US



City infrastructure is incapable of growing at a rate comparable to urban population growth

Congestion will increase as new forms of transportation continue to develop and over-saturate existing infrastructure and capacity

Economic growth and overall quality of life will decrease as the vitality and attractiveness of a city is compromised

Existing transportation systems fall short of meeting current and future demand

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The Promise of the Future of Mobility

The Future of Mobility offers an extraordinary promise, namely that more people and goods will be able to move faster, safer, cheaper, and cleaner than today

Vehicles operate autonomously, are highly utilized, and nearly never crash

Vehicles are consumed through end-to-end mobility providers and are less likely to be personally-owned assets

Taxation and public revenues shift from a fixed model to a more dynamic system

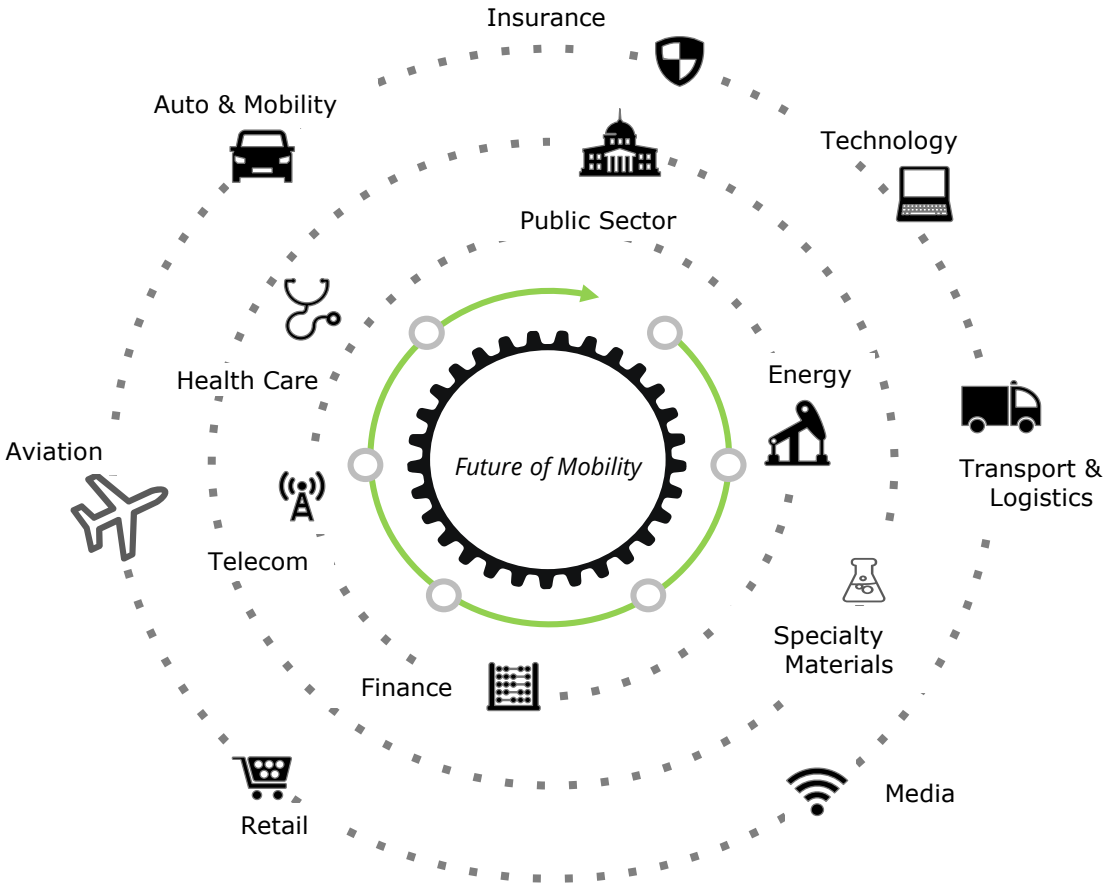
Seamless multi-modal transportation becomes the new norm

New, predominantly "driverless", cargo transportation and delivery systems emerge

Consumer data provides the highest sources of value in the mobility system

The Future of Mobility in Perspective

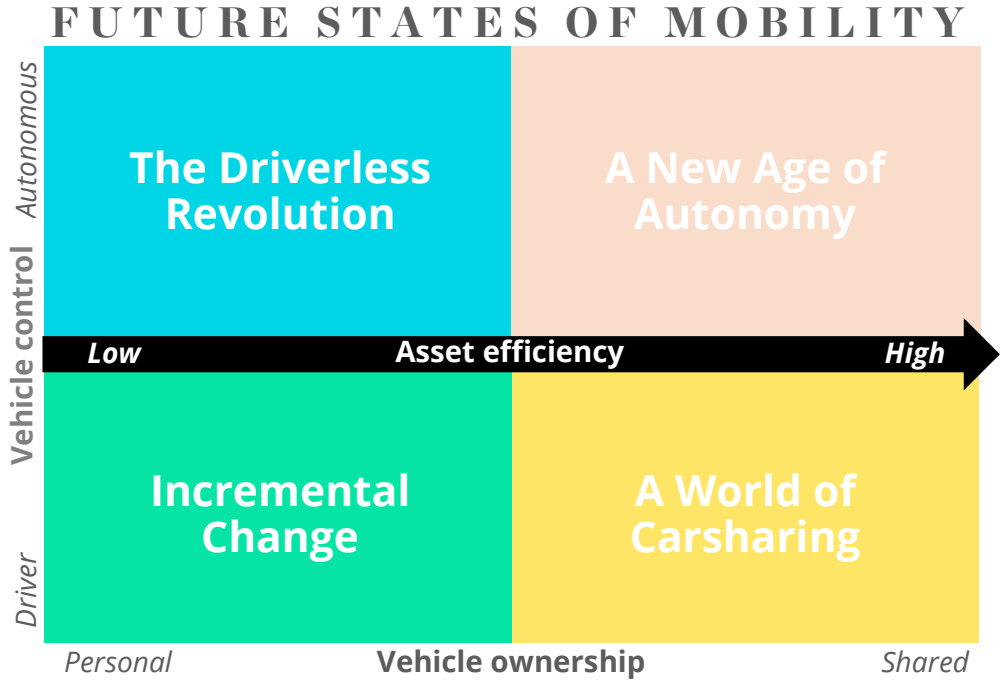
The pace of technological innovation is driving change across all parts of the mobility ecosystem, with broad implications to almost every industry



Converging Forces & Four Future States

Given converging social, economic, and technological trends, we believe four future states of mobility are emerging and will exist in parallel

- Maturing powertrain technologies
- Lightweight materials
- Rapid advances in connected vehicles
- Shifts in mobility preferences
- Emergence of autonomous vehicles



Unprecedented Urbanization

Trending Green

Safety and Security

Civic Engagement

Disruptive Technology

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This global transformation is profoundly shifting value across the mobility ecosystem

HARDWARE to SOFTWARE

Software, specifically machine learning, mapping, and AI, will play a crucial role in autonomous and shared transportation, allowing technology companies to capture value traditionally held by automotive OEMs

PRODUCTS to SERVICES

With shared mobility, consumers will be less concerned with vehicle make and model than the firm that delivers a superior service, increasing the value of transportation services over product manufacturers

POINT SOLUTIONS to PLATFORMS

While consumers today are willing to use a number of products for different elements of their mobility needs, overarching platforms will emerge to connect these disparate solutions, creating a unified customer experience and new system-wide efficiencies

PROVIDERS to TRUSTED ADVISORS

End users will increasingly look for tailored, predictive solutions rather than off-the-shelf, generic products; this will give rise to trusted advisors who utilize data around individuals' behavior and context to provide customized recommendations

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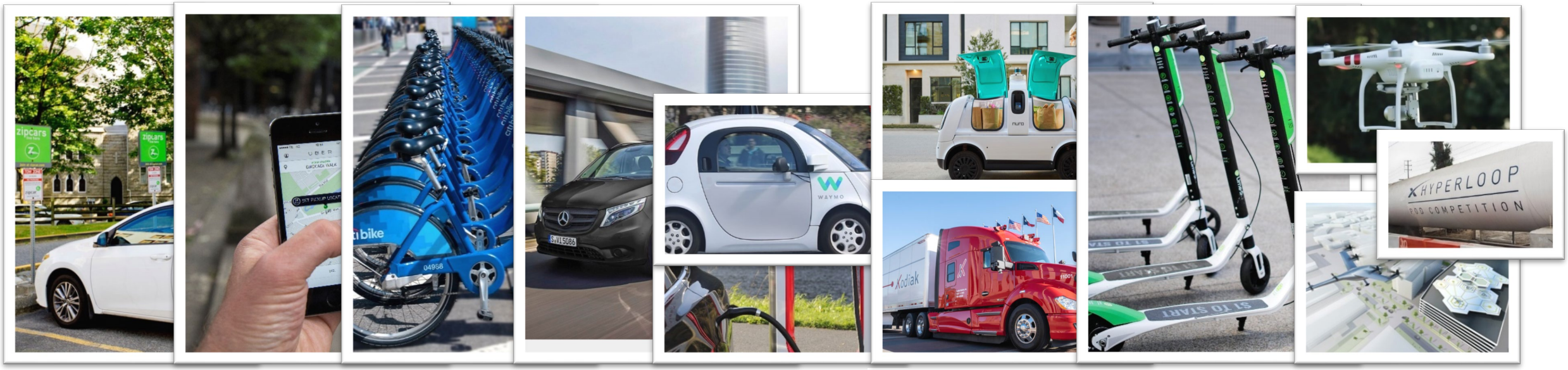
New Modes & Mobility Services

In just the last ten years, new mobility modes and business models have been introduced and adopted at unprecedented rates around the globe, changing the way users consume mobility

On-Demand Rentals → *Ride Hailing Revolution* → *Ubiquitous Bike Sharing Programs* → *On-Demand Shuttles* → *Rise of Passenger EVs and AVs* → *Logistics Automation & Electrification* → *Swift Adoption of E-Scooters* → *Drones, eVTOL & Hyperloop*



zipcar Uber citi bike via WAYMO TESLA nuro Kodiak Lime Wing Google

Micro-mobility (0-5 mi) *Medium Distance (5-15 mi)* *Micro & medium (0-15 mi)* *Long Distance (15+ mi)* *All distances*

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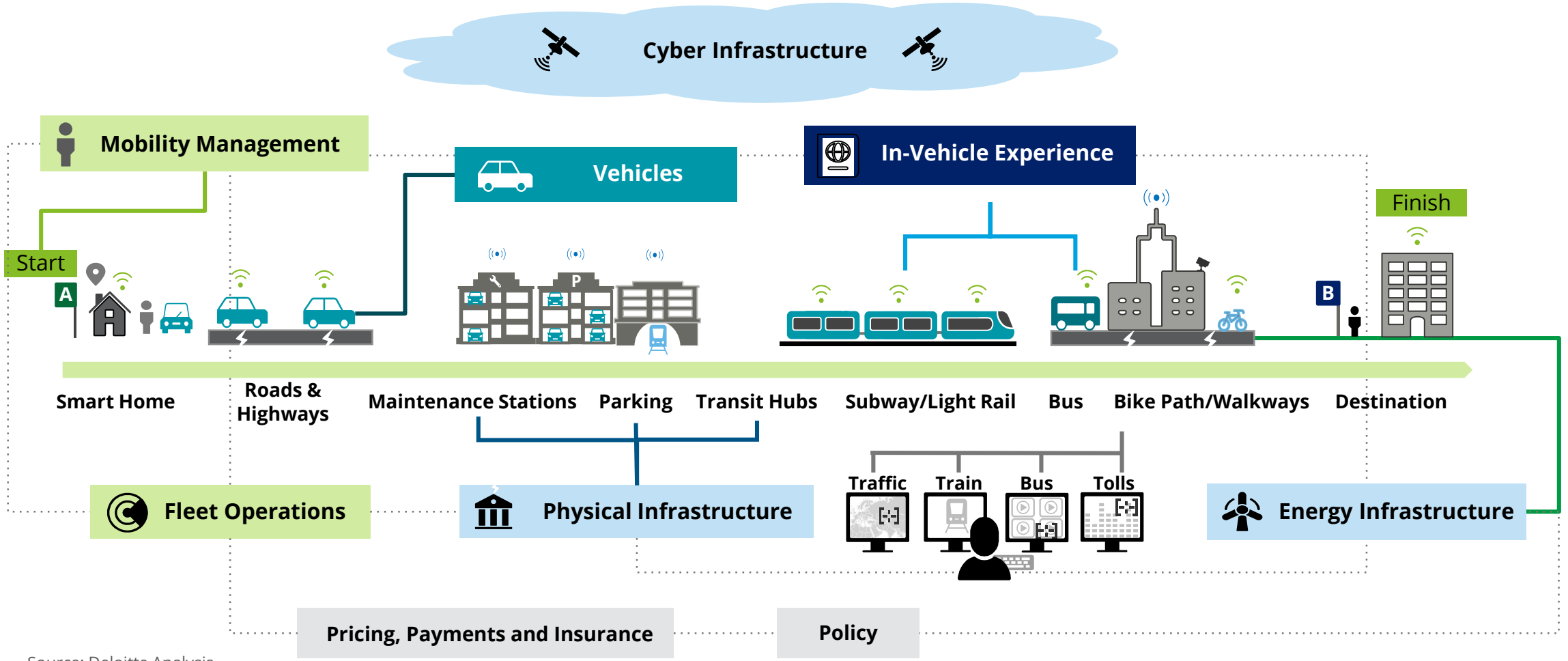
Seamless intermodal mobility is emerging

By engaging public- and private-sector leaders, this new mobility ecosystem has the potential to more optimally meet the rapidly changing needs of urban centers



Source: Deloitte Analysis

The SIMSystem Project

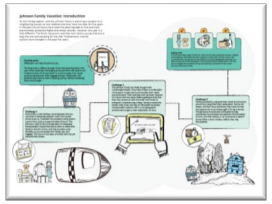
The SIMSystem project has developed and shared insights to help cities accelerate their progress in advancing seamless intermodal mobility

April 2017 | Jan 2018 | April 2018 | Jan 2019 | May 2019 | Jan 2020

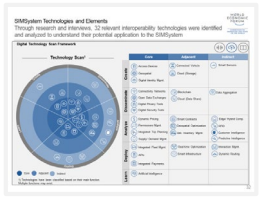
2017 – Phase I

Vision Setting and SIMSystem Manifesto Development

Vision and Use Case Development



Technology Scan and Global Networks Analysis



Published SIMSystem Manifesto with Guiding Principles

2018 – Phase II

Began Pilot Collaboration & Roadmap Design with Detroit, Ann Arbor, and Windsor

Received 13 applications from around the world

Held 6 Workshops and Knowledge Sharing Sessions

CASCAIS

SMART COLUMBUS

Jalon mtl

Selected our Pilot Team and Started Regional Roadmap Development

2019 – Phase III

Continuing the "Activation Journey", Supporting the Pilot Team & Exploring Best Practices

Detroit, Ann Arbor, and Windsor – Pilot Team Focused Support

Collaborate on activating a regional SIMSystem

Global Cities – Sprints to Uncover Best Practices for SIMSystem Activation

Select 10 cities globally that are leaders in mobility innovation and analyze global implementations of SIMSystem principles

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"Activating a Seamless Integrated Mobility System (SIMSystem): Insights into Leading Global Practices"

This report continued the journey to learn how to activate SIMSystems by supporting the pilot team and exploring best practices globally

OBJECTIVE

Our research in Phase III has focused on exploring the **strategic tensions and trade-offs** that cities (including our pilot region in Detroit, Ann Arbor, and Windsor) face in activating the SIMS Principles and highlighting **global best practices and recommendations** for cities on the journey to activating seamless intermodal mobility.

APPROACH

- Work with geographic pilot team on **3 use cases**
- Conduct interviews with **key stakeholders** in 8+ cities
- Profile the **journey of each of the cities** across several strategic tensions

CITIES

We selected a number of cities that we felt are innovative in their approaches to activating seamless integrated mobility systems:

- Detroit/Ann Arbor/Windsor
- Lisbon
- London
- Los Angeles
- San Diego
- Singapore
- Tel Aviv
- Tokyo

Future of Mobility

Across all cities, there are different journeys to activating seamless integrated mobility – but there are also a set of common themes

- **Political will is a determinant of everything**. Cities need leaders who are tireless advocates for adopting a "boundaryless" approach and can convene the various players (public and private)
- **Having a clear vision requires making hard trade-offs**. The trade-offs associated with prioritizing different outcomes make it important to match mobility transformation efforts to specific goals and objectives. Simply copying the playbook of another city is unlikely to work well
- **Governance structures matter**. Consider creating an empowered mobility management function within city government that has the authority and responsibility to drive initiatives forward and create alignment across all modes of transportation.
- **Successful cities have found a source of leverage** to attract partnerships, funding and talent to shape their mobility environment.
- **Pilots are not always the answer because seamless mobility requires ecosystem thinking**. Focus on specific and intended outcomes, not just the process.
- **Having data is necessary, but not sufficient—and reinventing the wheel is unnecessary**. Understanding what data exists, where it is housed and the rules that govern sharing and exchange is critical to success.

Strategic Tensions

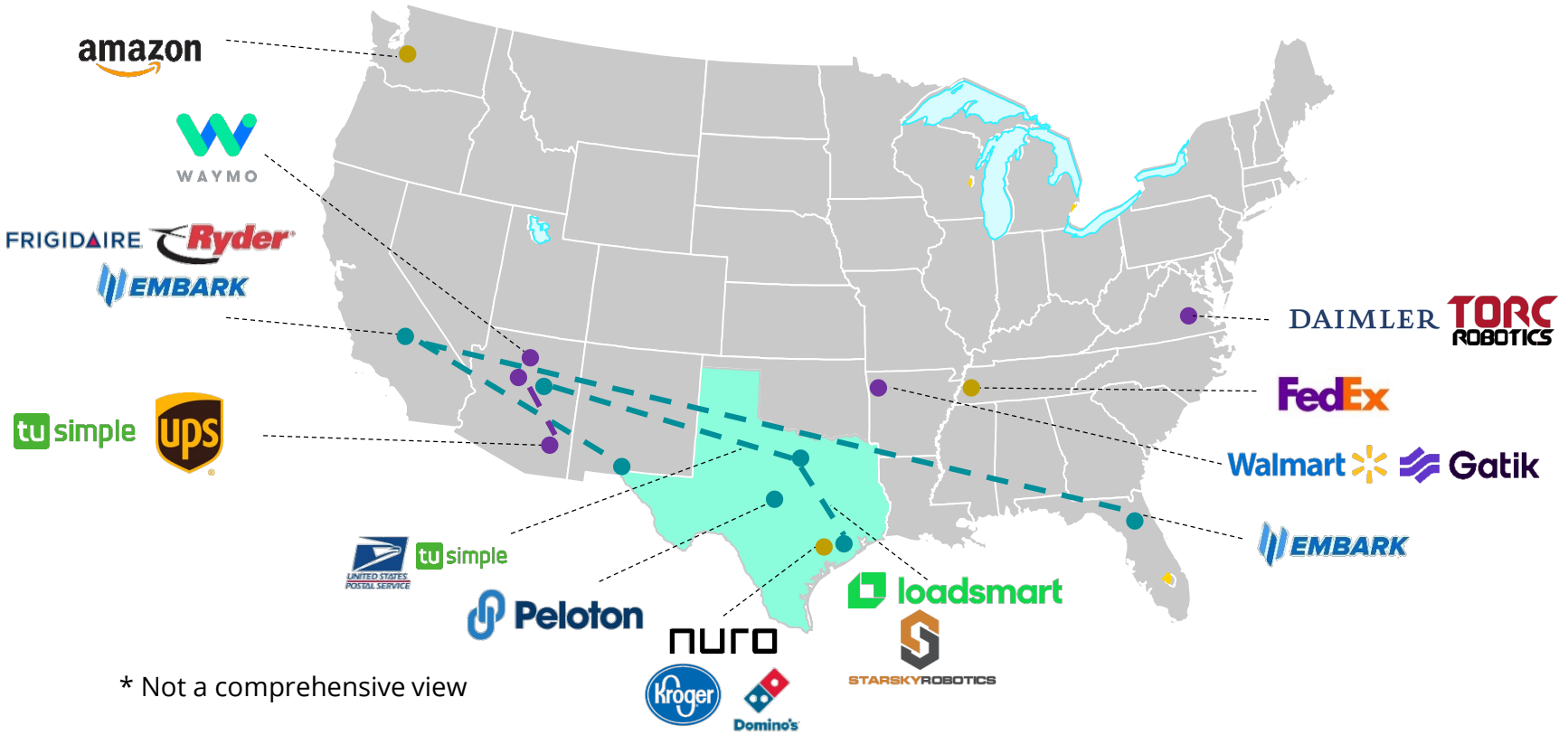
Proper balance and compromise is needed to realize the future of mobility

Public sector		Private sector
New modalities	VS.	Traditional infrastructure
Regulation		Innovation
Openness & transparency		Privacy and security

What does this mean for Texas?

Considering autonomous vehicles & freight as an example, Texas is already being recognized as a major testing ground

EXAMPLE: Autonomous Freight Deployments & Testing in the last 3 years*



* Not a comprehensive view

Other Notable Players

CAT · Uber Freight · SAP · VOLVO · RioTinto · Kodiak · Peterbilt

Deployment &Testing Key:

- Long-Haul
- Short-Haul
- Last-mile

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Challenges to Commercialization

Vision:

Finding **ONE** location representing a variety of real-world situations to test, scale, and commercialize technologies

Reality:

Testing in multiple environments is costly and impractical, and doesn't allow for business model development

AIRSPACE

Aerial testing requires:

1. A variety of airspace types
2. Regulatory relationships
3. Population density variations

AUTONOMOUS VEHICLE

Testing autonomous vehicles:

1. Private streets and public roads and highways
2. Partnerships with potential customers
3. Research facilities and university labs nearby

POPULATION DENSITY

Rural areas and urban areas are typically mutually exclusive in their locations:

1. Comprehensive UAV and UAS testing
2. Unmanned aerial and ground technology
3. Consumer adoption testing

PARTNERSHIPS

Interest and input from various industries is required:

1. Regulatory access and participation
2. Access to various industries for use and adoption testing
3. Ultimately, commercialization will require access from creators regulators, users, and customers

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ALLIANCE TEXAS

There is a market need for a mobility innovation hub

"North Texas is a great region for testing with favorable regulations. Some of our portfolio would be very excited to do trials there."

SF-based, VC Fund Manager

"There is a real need for an area where we can test business models, not just technology."

North TX, Aerial Manufacturer

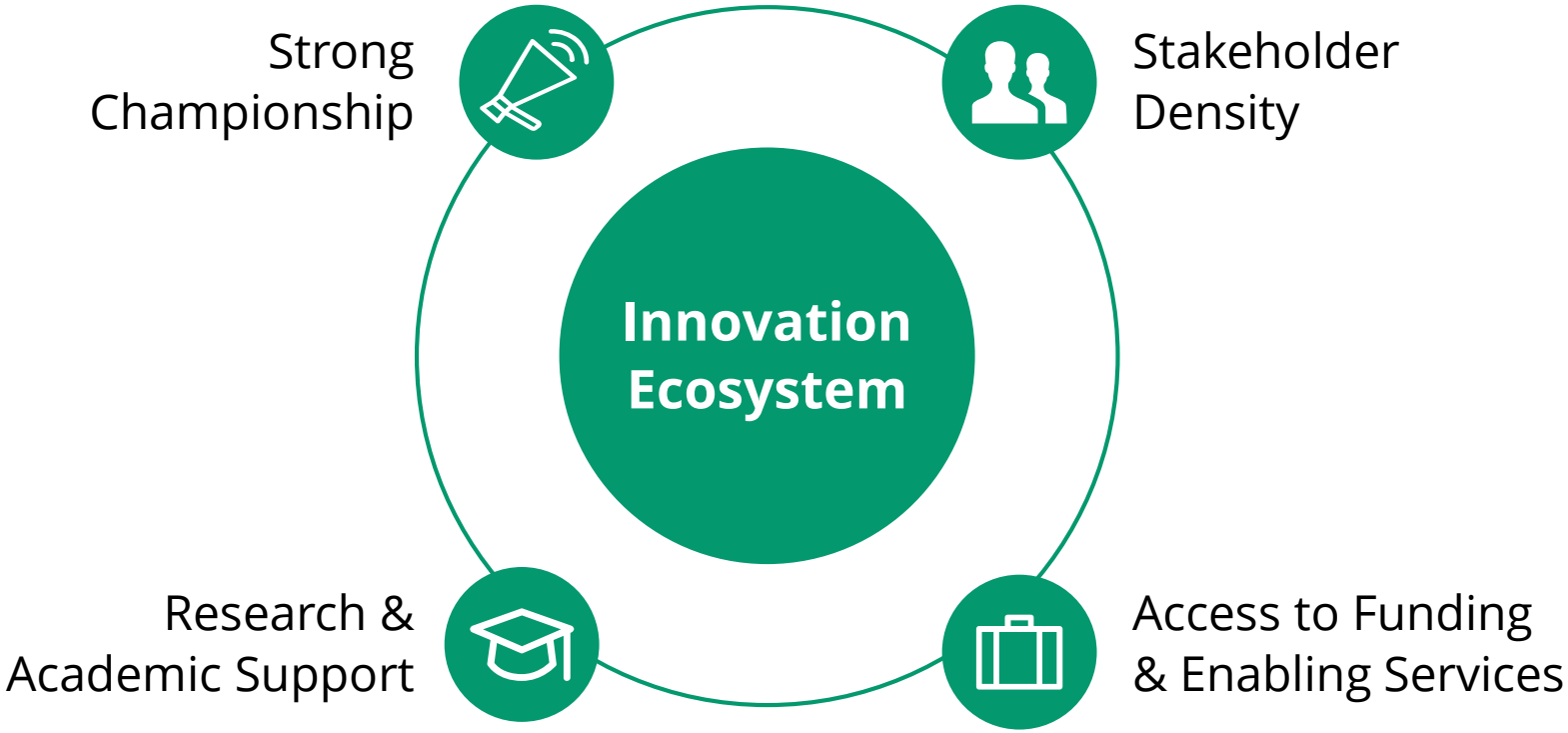
"It'll be integration [connected systems, devices, information flows] that drives attraction & retention of business and makes us sticky."

North TX, Logistics Provider

"A sandbox isn't enough, there has to be legitimate buyers and clients. That's a major selling point [of North Texas]."

SF-based, Accelerator

The Dallas-Fort Worth region has the right ingredients to fill the mobility innovation hub white-space



The Mobility Innovation Zone leverages built-to purpose INFRASTRUCTURE, differentiated capabilities and SERVICES, and public-private ECOSYSTEM ENGAGEMENT to catalyze the commercialization of MOBILITY SOLUTIONS on the ground and in the air.

Essential Success Factors

Alignment with strategic vision, clarity, communication, and continued engagement with stakeholders are essential to the success of mobility innovation

Networked leadership — Involve and align stakeholders across departments and industries early, prioritize staying aligned.

Compelling business case — Present an idea that stakeholders can easily understand and articulate.

Outcomes based — Clearly define the desired outcome of a project; cluster and sequence projects accordingly.

Inclusion and access — Focus on results that will benefit all constituents.

Dynamic approach to regulatory framework

Data governance — Don't underestimate the importance of governance for usability, consistency, integrity and security of data

Integrated technology platform — Integrate the foundation, including system architecture, interoperability, and cybersecurity

We have a once-in-a-generation opportunity to transform mobility in urban & suburban environments and transportation hubs

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Thank You!