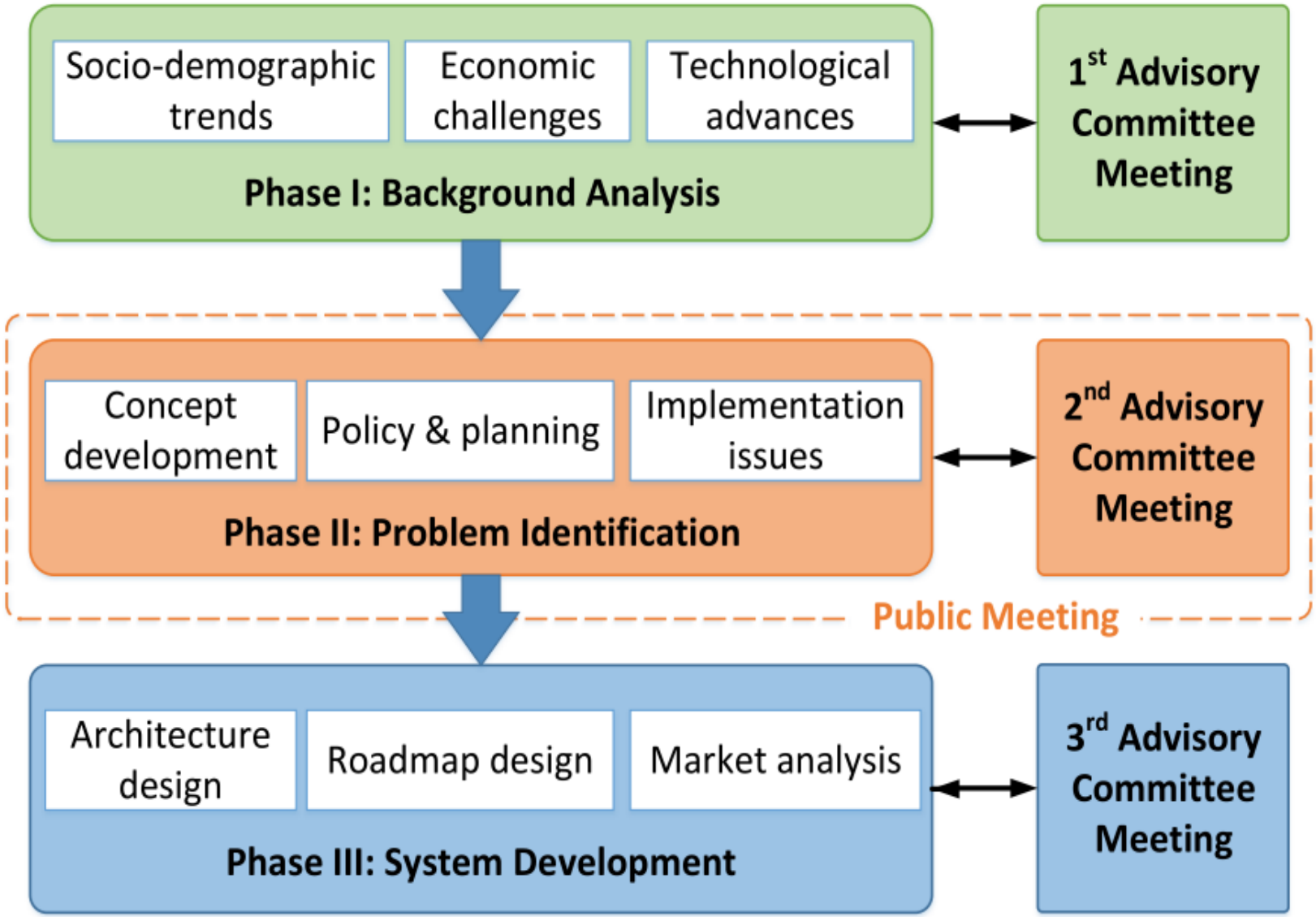
Wisconsin Mobility as a Service (WMaaS)

Connecting Wisconsin of Tomorrow: Methods to Improve Public Mobility under Future Social, Economic and Technological Changes

-Presented at 2019 WIPTA Conference

Presented by Drs. **Jie Yu and Edward Beimborn**
University of Wisconsin-Milwaukee

Project Overview



ACKNOWLEGEMENT

Advisory Committee Members:

1) James Davies, Senior Director of Operations and Planning, Bublr Bikes;
2) Brian Engelking, Transit Manager, Waukesha Metro Transit;
3) Lynn Gilles, WIPTA chair/Transit manger, City of Fond Du Lac;
4) Kevin Muhs, Executive Director, SEWPRC;
5) Ian Ritz, Chief of Transit Section, Wisconsin DOT;
6) Justin Running, General Manager, Running Incorporated
7) Jeff Sponcia, Transit Manager, MCTS;
8) Jason Wittek, Transit Superintendent, Ozaukee County

What is MaaS (Mobility-as-a-Service)?

Definition

Mobility-as-a-Service (MaaS) describes a shift away from **personally-owned modes of transportation** and towards **mobility solutions that are consumed as a service**.

Source: Wikipedia MaaS

Benefits

Government

- **Less owners, more users**
- **Less parking shortage, congestion, emissions**
- **Public health, social equity**
- **Better urban-urban, urban-suburban, urban-rural connectivity**

Transport providers

- **Improved efficiency**
- **Increased users**
- **Filling up gaps, e.g. reliability + flexibility**
- **New business opportunities**

Travelers

- **Lower prices, better service**
- **Tailored transportation service**
- **Safe & secure**
- **Instant feedback**

Key Concept

- MaaS is an on-demand, real-time platform that can include any combination of different transport modes such as public transit, cars, taxis, and bike sharing, through a unified gateway that creates and manages the trip, which users can pay for with a single account.

What is going on around the world?

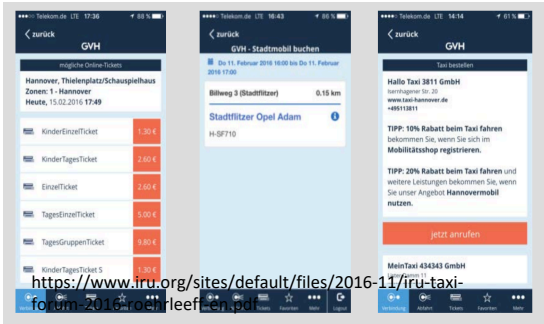
MaaS around the World (2018)

https://whimapp.com/

Whim, Finland

https://www.fluidtime.com/en/project/ubigo/

UbiGo, Sweden

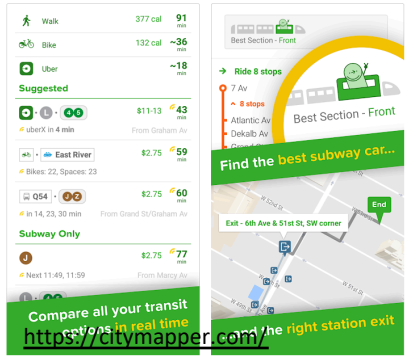


https://www.iru.org/sites/default/files/2016-11/iru-taxi-forum-2016-roel-erleef-en.pdf

Hannovermobil, Germany

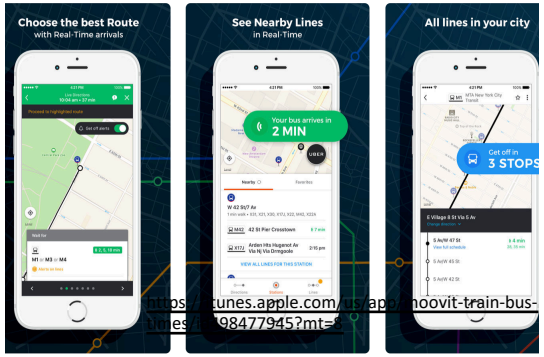
https://transitapp.com

Transit, US



https://citymapper.com/

Citymapper, US



https://itunes.apple.com/us/app/moovit-train-bus-[illegible]98477945?mt=8

Moovit, US

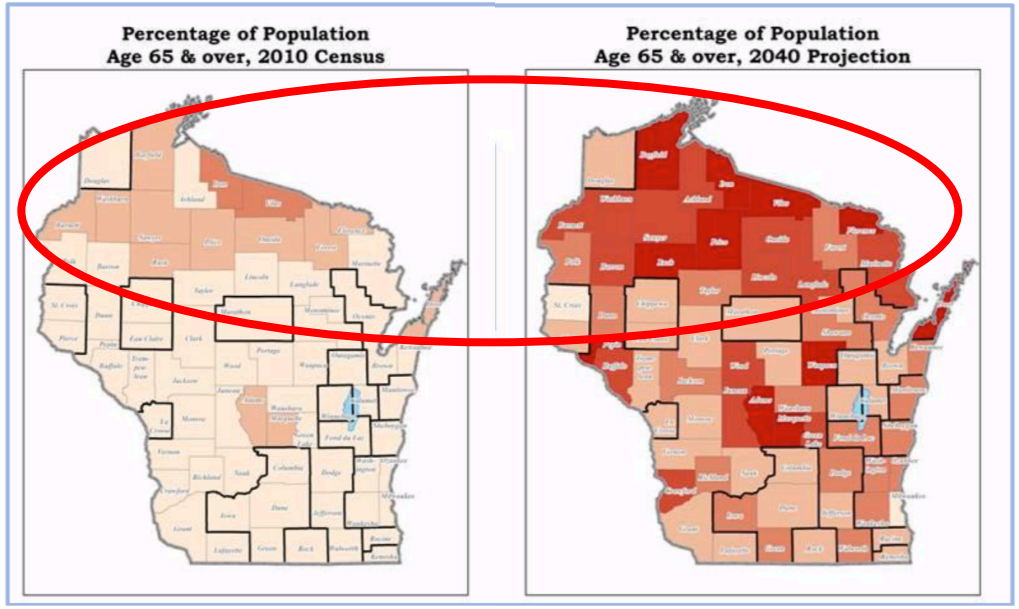
Wisconsin is different!

Aging Population

- Young elderly (ages 65-84) ***almost double,*** "Old elderly" (ages 85 and over) nearly increase ***one and one-half***

- Northern counties are projected to have ***more than 3 out of every 10 residents over 65 in 2040***.

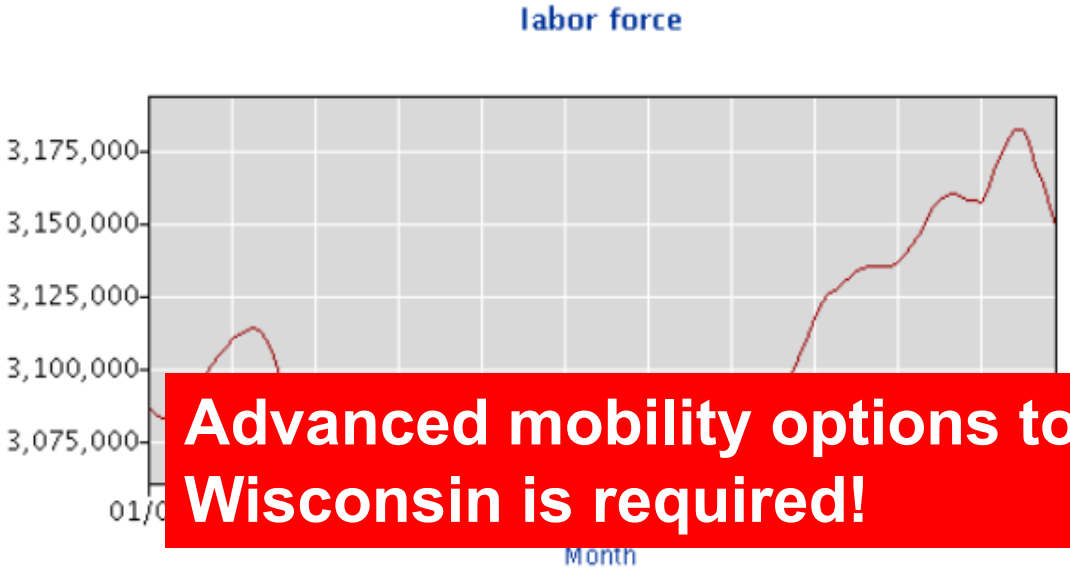
Population of age groups in Wisconsin: 2010 VS 2040



Source: Wisconsin Department of Administration Demographic Services Center, 2013

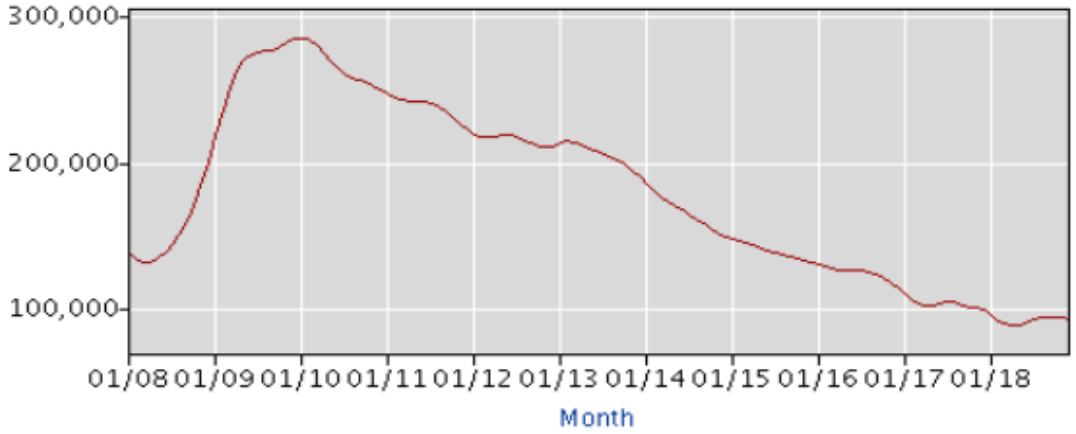
Wisconsin is different!

Labor Shortage



Advanced mobility options to retain the new labor force in Wisconsin is required!

- Rise in labor force between 2013-2017 (After 2008 Recession).
- Increase in working age group - demands Latest Technology

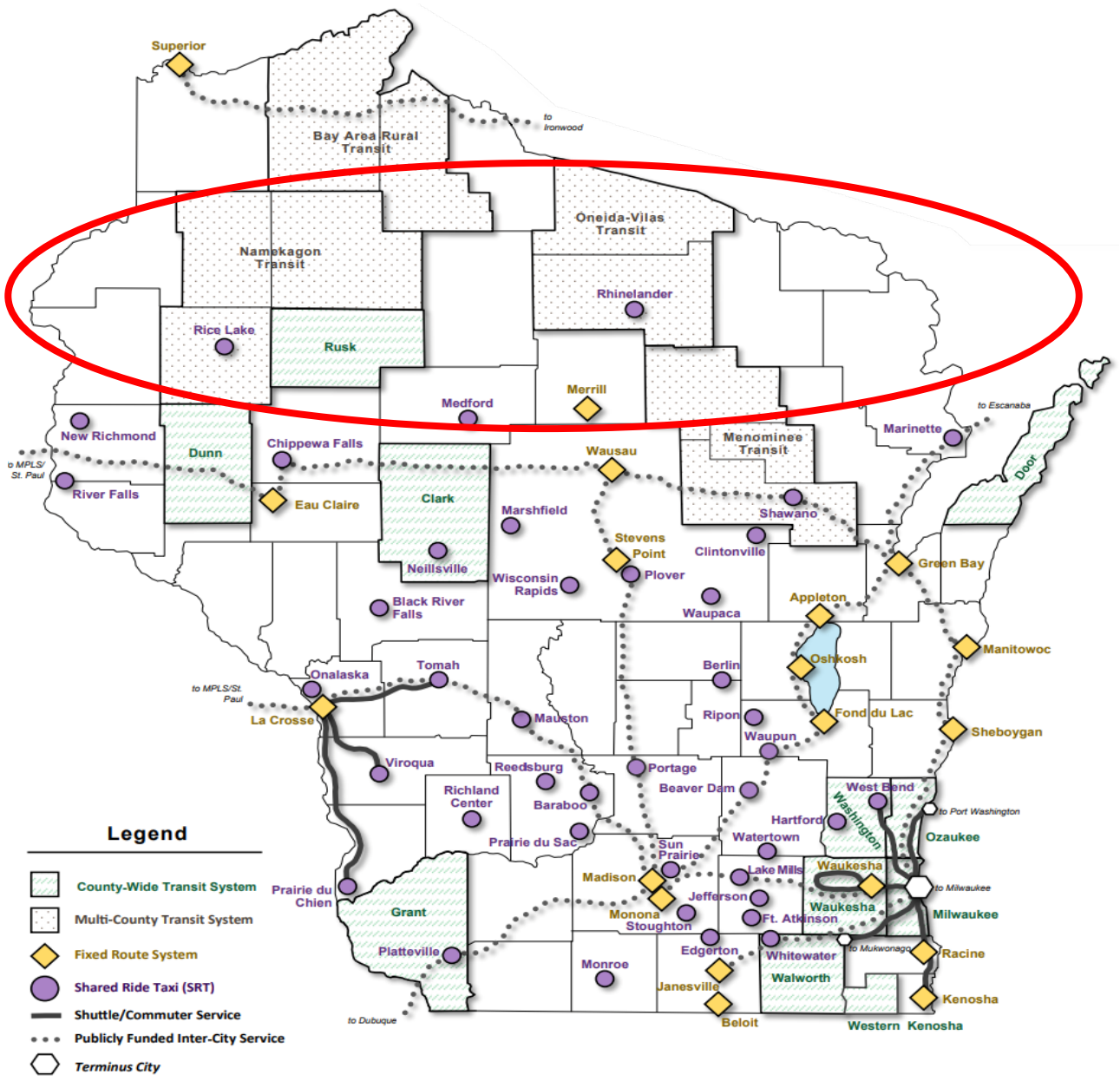


Source: https://www.bls.gov/eag/eag.wi.htm
https://crowe.wisc.edu/an-outlook-for-the-wisconsin-economy-in-2018/

Wisconsin is different!

Public Mobility Challenges

Residents in suburban and rural communities of Wisconsin have little access to fixed route transit but more chances to use shared-ride taxis.

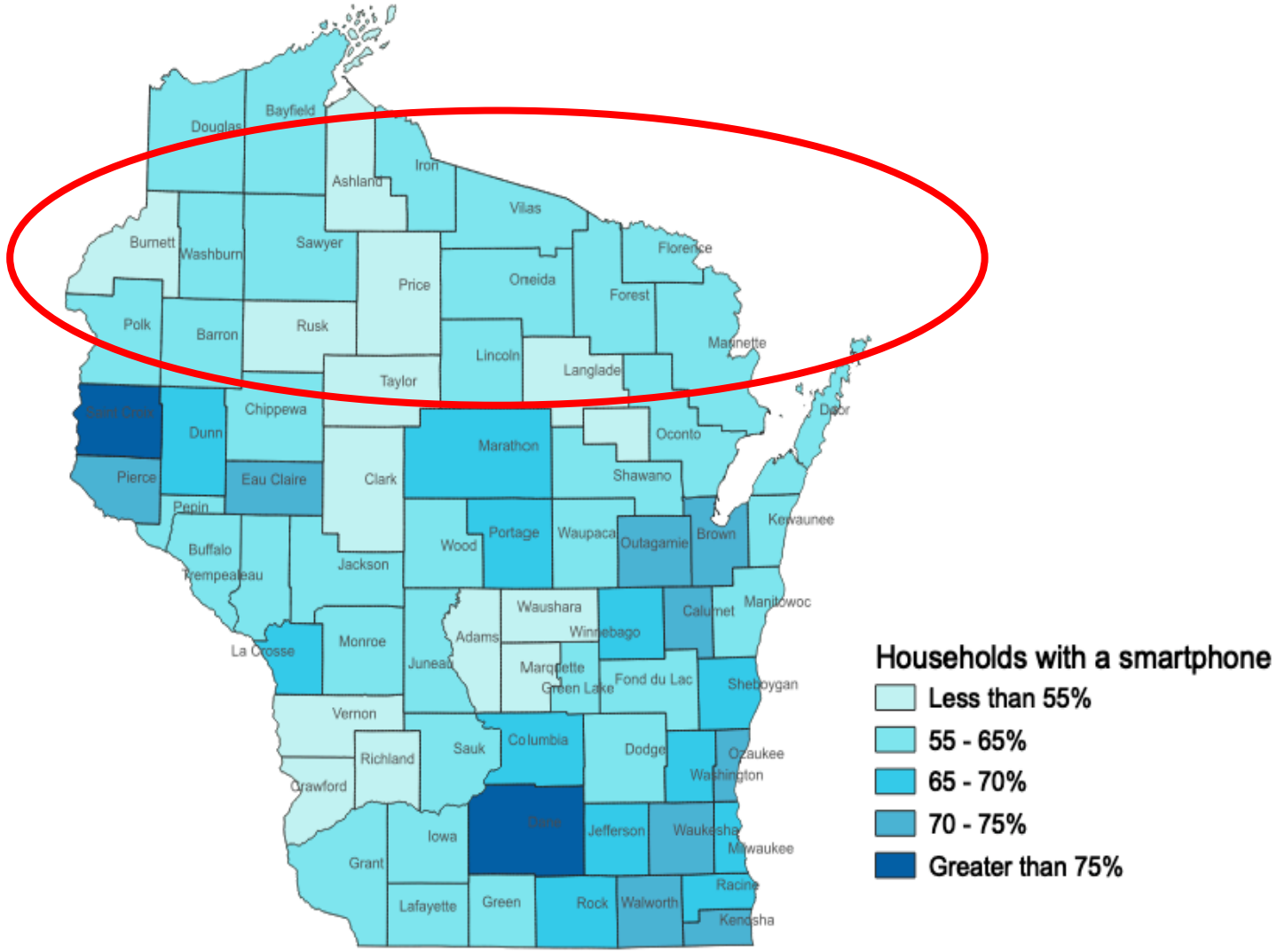


Source: https://wisconsindot.gov/Documents/travel/pub-transit/system-map.pdf

Wisconsin is different!

Smartphone Availability

Development of MaaS may encounter obstacles due to limited smartphone availability in most rural and small urban counties.



Source : U.S. Census Bureau

Identification of Critical Issues

Concept Development

- **Aging and people with disabilities**
- **Low-income travelers**
- **Limited smartphone availability**

Policy & Planning

- **County/city boundary**
- **Legal criteria**
- **Funding**

Implementation

- **Data Issues**
  - Standardization
  - Real-time availability
  - Security
- **Payment Integration**

Identification of Critical Issues

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Key findings

Aging and people with disabilities

- **Growing numbers**
- **Public transport user-oriented options**
- **Federal and state support**

☐ **Marketing strategy**

- Household-based VS individual-based access
- Pay-as-you-go, monthly, yearly membership

☐ **Tailored service packages**

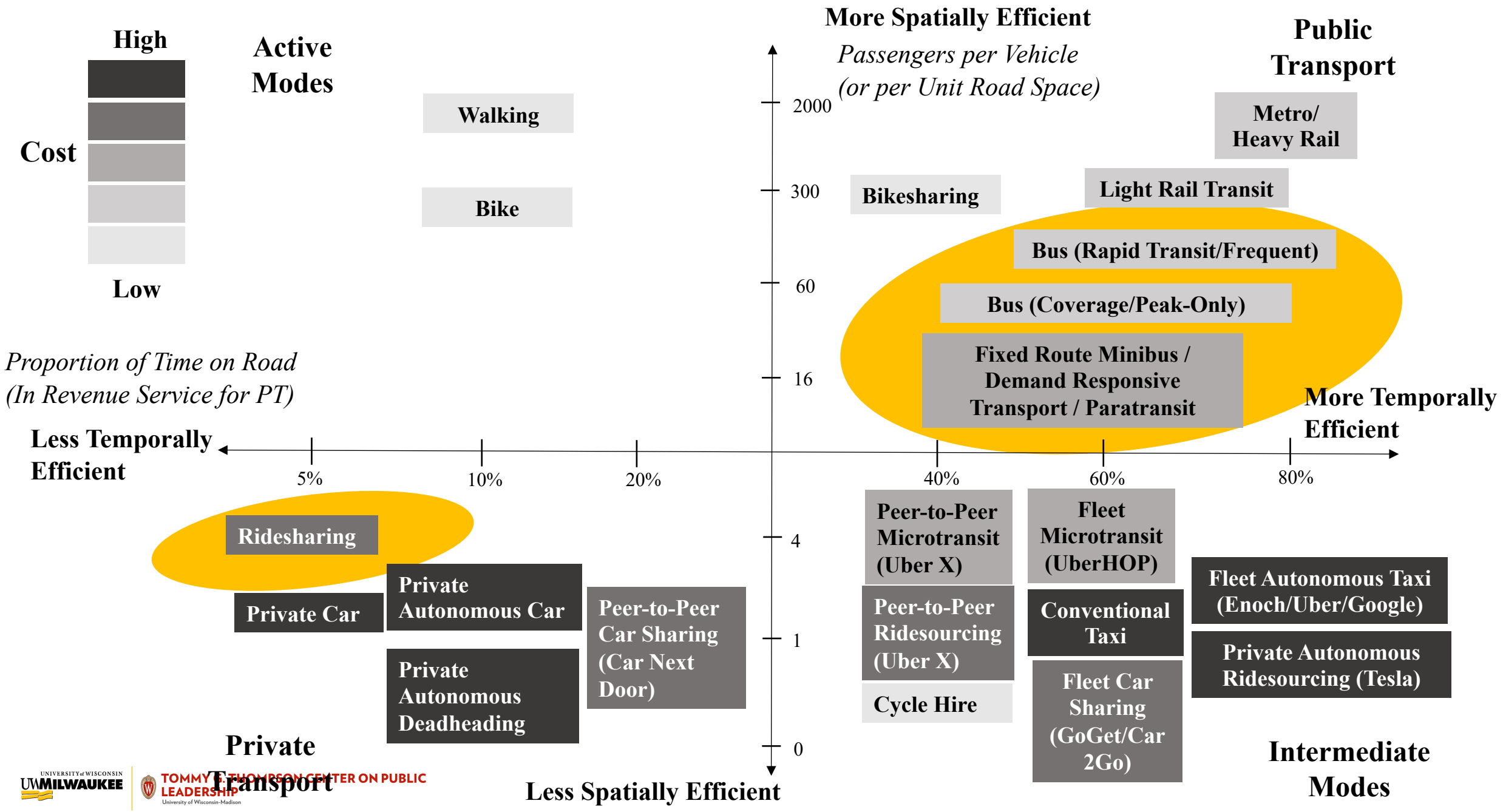
- Volunteer/Paid transportation service
- Health care trips
- Cross-boundary trips
- Paratransit service

☐ **Elderly & disabled-friendly App**

- Increase the Contrast Between Text & Background
- Label Icons to Avoid Miscommunication
- Format Fonts, Icons & Interactive Elements
- Avoid Complex Navigational Elements
- Cues, Noises & Reminders

☐ **Telephone customer service**

☐ **Website**


High
Cost
Low
Active Modes
Walking
Bike
More Spatially Efficient
Passengers per Vehicle
(or per Unit Road Space)
2000
300
60
16
4
1
0
Less Spatially Efficient
Public Transport
Metro/ Heavy Rail
Light Rail Transit
Bikesharing
Bus (Rapid Transit/Frequent)
Bus (Coverage/Peak-Only)
Fixed Route Minibus / Demand Responsive Transport / Paratransit
Proportion of Time on Road
(In Revenue Service for PT)
Less Temporally Efficient
5%
10%
20%
40%
60%
80%
More Temporally Efficient
Ridesharing
Private Car
Private Autonomous Car
Private Autonomous Deadheading
Peer-to-Peer Car Sharing (Car Next Door)
Peer-to-Peer Microtransit (Uber X)
Peer-to-Peer Ridesourcing (Uber X)
Cycle Hire
Fleet Microtransit (UberHOP)
Conventional Taxi
Fleet Car Sharing (GoGet/Car 2Go)
Fleet Autonomous Taxi (Enoch/Uber/Google)
Private Autonomous Ridesourcing (Tesla)
Private Transport
Intermediate Modes

Key findings

Low-income travelers

- **Tailored service packages**
- **Job access**
- **Volunteer-to-earn trips and cost-assistance**

☐ **Tailored service packages**

- Public-oriented trips, e.g. Fixed-route transit + bike-sharing + walking
- Eco-friendly trips, e.g. bike-sharing + walking

☐ **Volunteer-to-earn-trips programs**

- Provide care for trips of old and disabled people
- Help regularly evaluating MaaS system, give valuable feedback
- Volunteer drivers

☐ **Cost assistance**

- Employers-based program
- Discounts, e.g. *Universal PASS, TD (Transportation Disadvantaged) late shift in Pinellas County, Florida*
- User-side subsidy

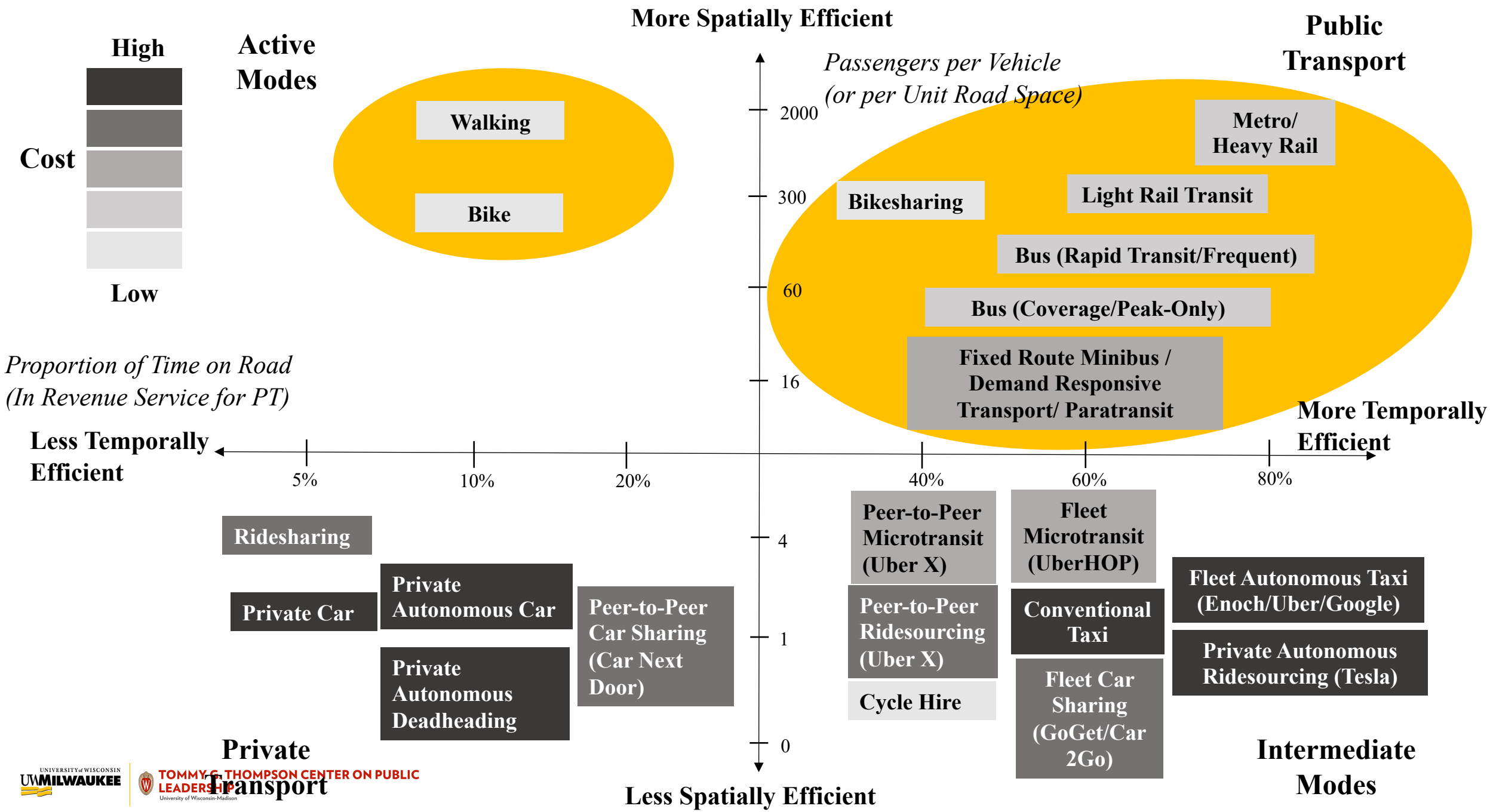
Pinellas Suncoast Transit Authority's TD Late Shift Program

- Transport **Low-income residents** travel to and from work when bus service is not available
- Providers: **Uber and United Taxi, and Care Ride** (wheelchair provider)

TD Bus Pass: $11
Add Late Shift: +$9
Total Monthly Package: $20

- *Up to **400 users per month***
- *Average **14 monthly trips per person** (September 2018)*
- ***4,730 trips** in April 2018*
- *Seeking **additional funding to expand***

https://www.psta.net/programs/td-transportation-disadvantaged/
https://www.apta.com/pilot-of-the-month-pinellas-suncoast-transit-authoritys-td-late-shift-program/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Private Autonomous Ridesourcing (Tesla)

Key findings

Limited smartphone availability

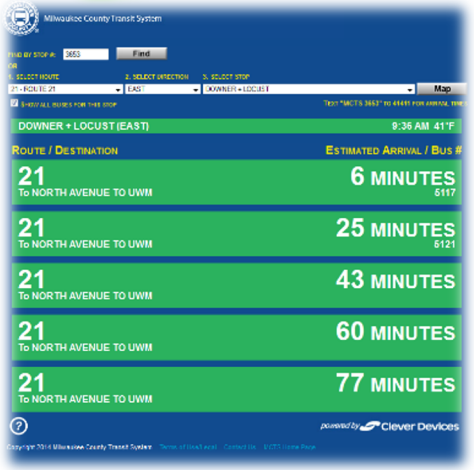
- **Changing rapidly**
- **Alternative web and tele communication based solutions**

Service request – alternative to cell phone:

- **Web** and **call center** ordering.
- Sign up procedures.

Integrated solution:

- **Single phone number** and **website**;
- FAQs; Technical support**.**



Alternatives to smart phone reservation:

- **Teletaxi: Door to door trip** at public transit fare.

le-route: On-demand mobility service

- **Telependler(Telecommuter):** Home => Public transit => Work/school

Real Time Updates: Web based

Identification of Critical Issues

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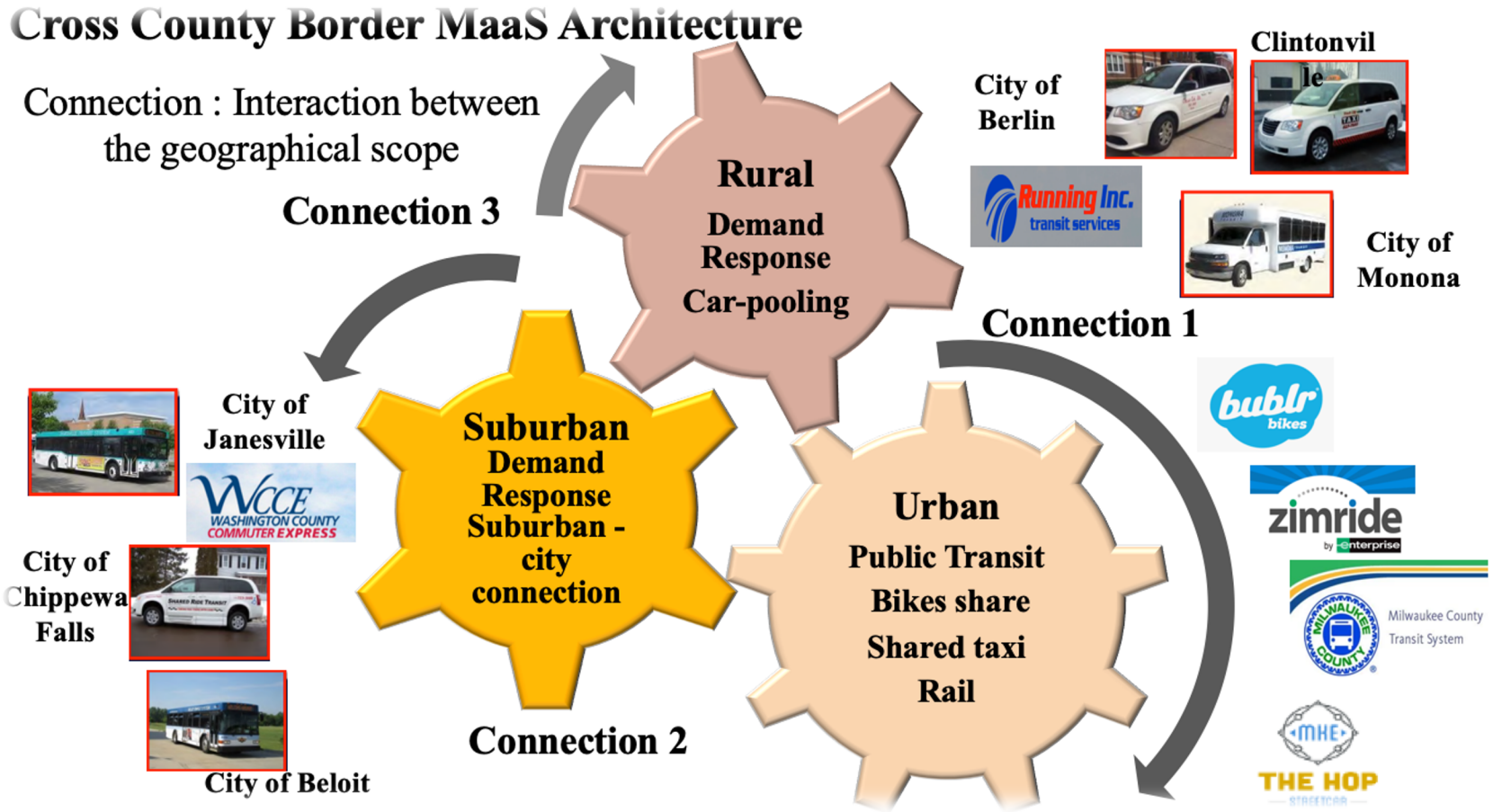
  - Security
- Payment Integration

Key findings

County/city boundary

- **Agreements of possible Wisconsin Cross County Maas system Architecture**



Source :

https://maas-alliance.eu/wp-content/uploads/sites/7/2017/09/MaaS-WhitePaper_final_040917-2.pdf

https://www.ers.usda.gov/webdocs/DataFiles/53180/25603_WI.pdf?v=0

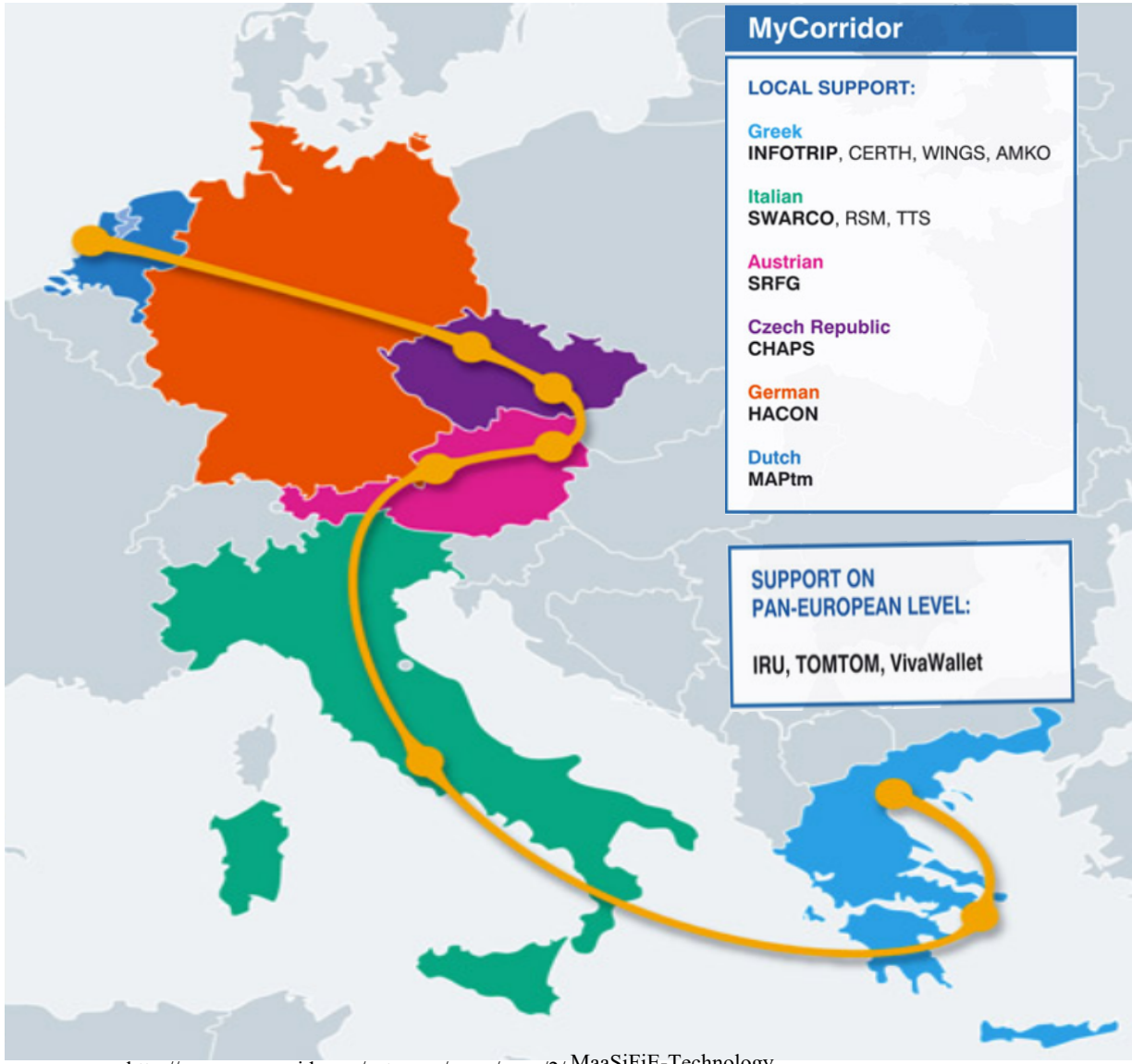
https://wisconsindot.gov/Documents/doing-bus/local-gov/astnce-pgms/transit/annual-report.pdf

Cross County Border MaaS Agreement

Agreements defining Cross County Border MaaS:

- ❑ **Operational geographical area** scope.
- ❑ **Transport modes** involved.
- ❑ **Additional roaming cost**.
- ❑ **Data privacy**.
- ❑ Time boundary: Data **retention** and **handling**.
- ❑ Ticket **reservation** and **cancellation** policies.
- ❑ **Interface specification**(connecting partner operator services).
- ❑ **Revenue allocation** -transport service provider.

MyCorridor-Cross-border PanEuropean Corridor (Greece, Italy, Austria, Germany, Czech Republic and the Netherlands)



http://www.mycorridor.eu/category/news/page/2/ MaaSiFiE-Technology

Key findings

Legal criteria

- **Defined issues to be covered in future regulation**

☐ Current legal criteria

Federal Highway Administration

- Legislation
- Regulation
- Policy
- Guidance
- Information

Wisconsin State Legislature

- Administrative Code

https://www.fhwa.dot.gov/resources/legsregs/
https://docs.legis.wisconsin.gov/code/admin_code/trans

Key findings

Legal criteria

- **Defined issues to be covered in future regulation**

☐ To be established

- Access to market e.g. Permission to resell tickets
- Open data, e.g. FTA Open Data Policy Guidelines
- API(Application Programming Interface) & data standardization, e.g. LADOT Guidelines for Handling of Data from Mobility Service Providers
- Data security
- Payment system standardization
- National/regional incentive to develop MaaS
- Protecting passengers' safety and security
- Facilitating technology development
- Cooperation in traveling between counties and cities

Case: Finland Act on transport services, 2017.

Key findings

Funding

- **Potential business models of WMaaS**

Key roles in MaaS Ecosystem

- Transportation service provider
- MaaS service operator/integrator
- Logistics service provider
- Government
- Travelers

Commercial-Oriented

Financing

Public-Oriented

Federal funding
State funding
PPP

Research

Federal Grant
State Grant

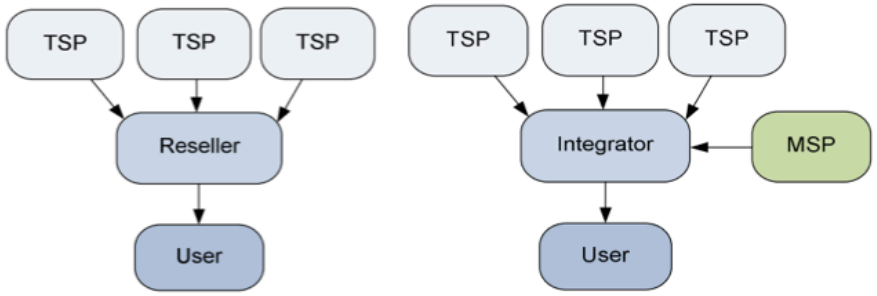
Key findings

Funding

- **Potential business models of WMaaS**

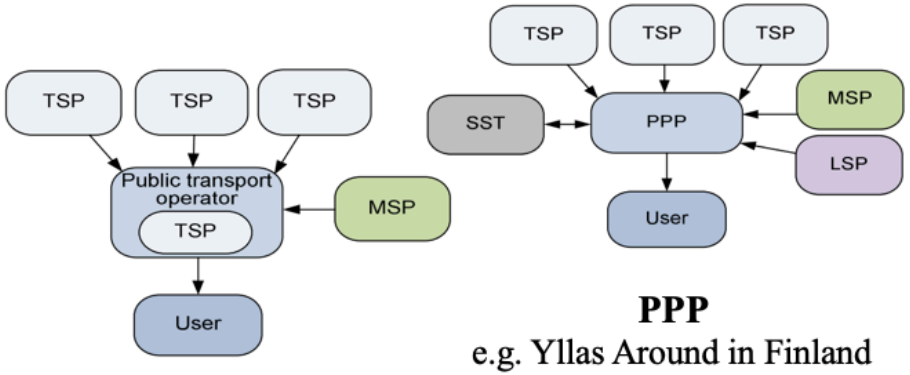
Business models: Partnership

- **Commercial-Oriented**
  - Reseller
  - Integrator
- **Public-Oriented**
  - Public transit operator
  - PPP (Public Private Partnership)
  - PPPP (Public Private People Partnership)



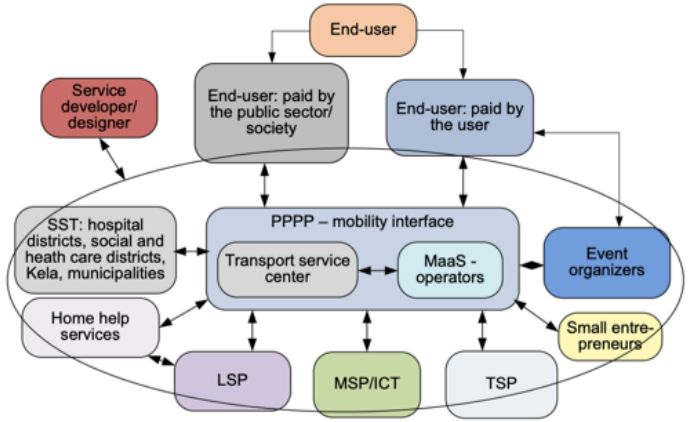
Commercial: Reseller
e.g. UbiGo in Sweden

Commercial: Integrator
e.g. Whim in Finland



Public transit operator
e.g. HANNOVERmobil in Germany

PPP
e.g. Yllas Around in Finland



PPPP --- ongoing research for rural cases

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  - Real-time availability
  - Security
- **Payment Integration**

Key findings

Data Issues
- **Standardization**
- Real-time availability
- Security

❑ **Standardization: Stakeholder interaction framework and data formats required for MaaS**

Data standards between Transportation Service Providers and MaaS Operators

Type	Format	Developer
Transit	GTFS (General Transit Feed Specification, static)	Google & TriMet, 2006
	GTFS Realtime (realtime public transit data)	Google & Transit Developers, 2011
Demand-responsive transportation	GTFS-flex	Google, Trillium, etc., 2016
Bikeshare	GBFS (General Bikeshare Feed Specification)	NABSA (North American Bikeshare Association) with bikeshare operators, 2015
TNCs (e.g. Uber, Lyft)	Custom API (Application Programming Interface) s	
Carshare (e.g. Zipcar, Car2Go)	Custom API (Application Programming Interface) s	
Streets	OpenStreetMap, SharedStreets, Open 511, Datex	

Interoperability of Data can only be achieved through data Standardization by enabling :

- **Unified and centralized data structures in different data sources**
- **Data pools coming from different transport sectors merged.**
- **optimized route planning and transport safety, enabled by open data.**

Need to be standardized

Key findings

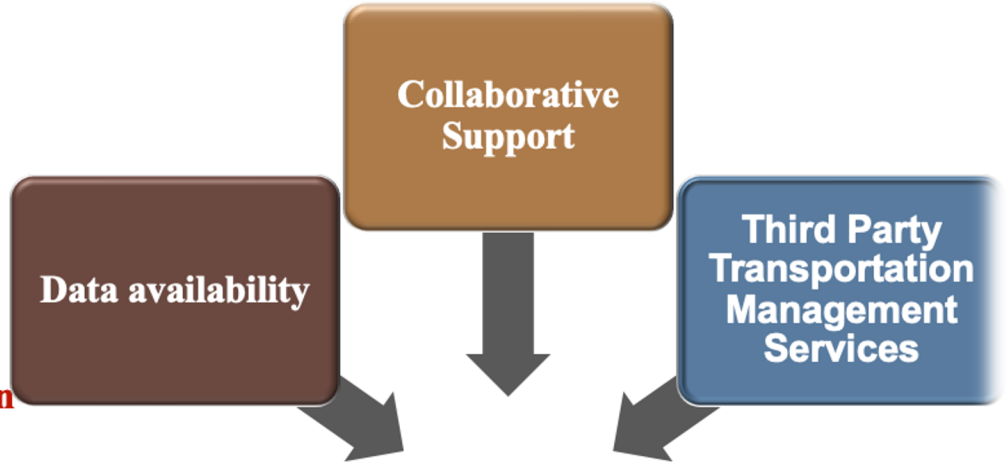
Data Issues
- Standardization
- **Real-time availability**
- Security

❑ **Real-time availability: Identified the data availability and collaboration support required amongst different stakeholders providing MaaS Service**

Data availability :
- **Open Data Cloud**
- Standardized open formats
- Accessible to app developers, City staff, and researchers.

Collaborative Support:
- Private , Public or Third part **collaboration in Data Sharing**
- Contract- Access systems through open API

Third Party Transportation Management Services:
- Navigation App Data
- Mixed-mode Trip Planning
- Regional, Multimodal Connectivity for Real-time Passenger Information (RTPI)



Integrated Real Time Information

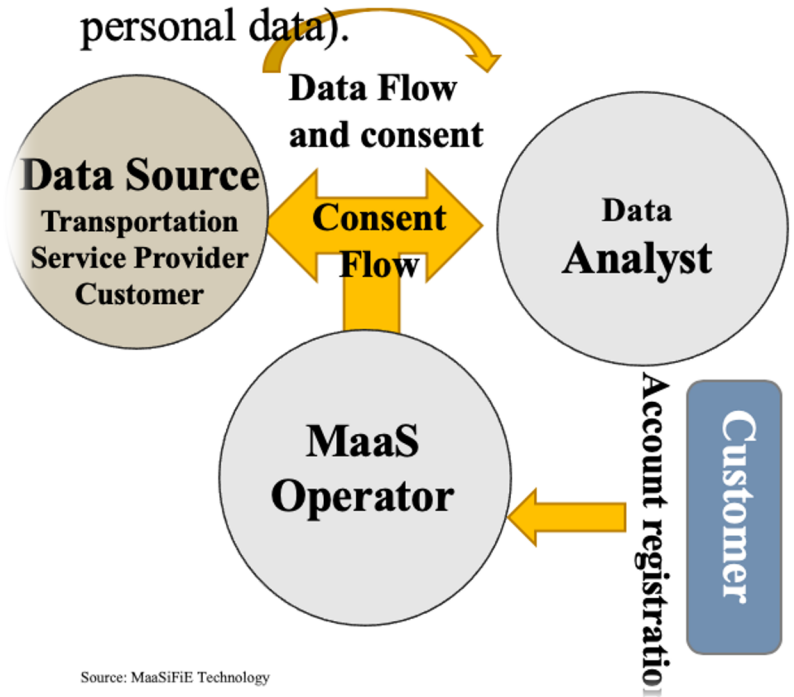
Key findings

Data Issues
- Standardization
- Real-time availability
- **Security**

❑ **Security: recognized possible consent flow directions and legal permission for data security**

Personal Data Security

- Account: Personal data management; UK, Finland.
- **Consent** to service providers (access to personal data).



Source: MaaSiFiE Technology

- Service Registry : Database of services accessible with this operator; **Legal permissions** and **consents** for data use.
- After consent: **Direct data transfer** using Application Programming Interface.

Customer: Consent to service providers => access personal data.

MaaS Operator: Digital consent management; Service authorization;

Data Source : Provides data to service providers.

Data Analyst :accesses data; analyses; enables standardization ; interoperability and optimization .

Key findings

Payment Integration

- **Possible payment options available for different service users**
- **Different revenue allocation structures for the Transportation Service Provider (TSP)**

Issue 8: Payment Integration

Frequent riders- Cheaper Option:

- Monthly pass(unlimited trips) on designated transit agencies

Infrequent riders:

- Pay as you go option
- Phone activation
- Tap to activate

Contactless bankcards & mobile wallets:

- Easy to load and use-tap and go.
- Registering - loss or theft protection;

Cash or Web based payment:

- Rural or low smart phone based areas.
- Instant cash payment
- Web based electronic payment.

Payment System : Possibilities for Wisconsin

Prepaid Card

- Transfers: Between Certain mode choice (Example: MCTS and HOP);
- Refill Balance and Use (Min-Max Value)
- No Monthly Invoice

Rural or Limited Smart Phone Accessibility Payment Options

- Direct Cash Payment to Service Provider
- Registered Web based account ; Balance accumulated per use;
- Usage updated: Email notification ;
- Monthly Invoice : Electronic Credit card payment ;

Account Credit

- Registered Web based account ; Smart Phone Application;
- Balanced accumulated per use;
- Email notification ; Account update;
- Monthly invoice : Electronic credit card payment

Promotions and Offers

- Cash Back offer on Smart Mode Choice
- Transfer offers / Point accumulation : Certain Mode or route choice.

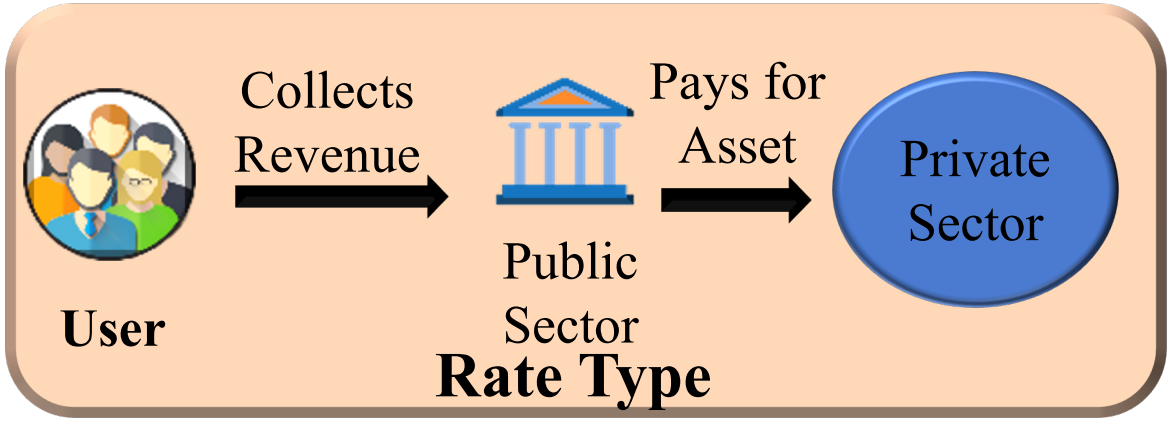
Benefits

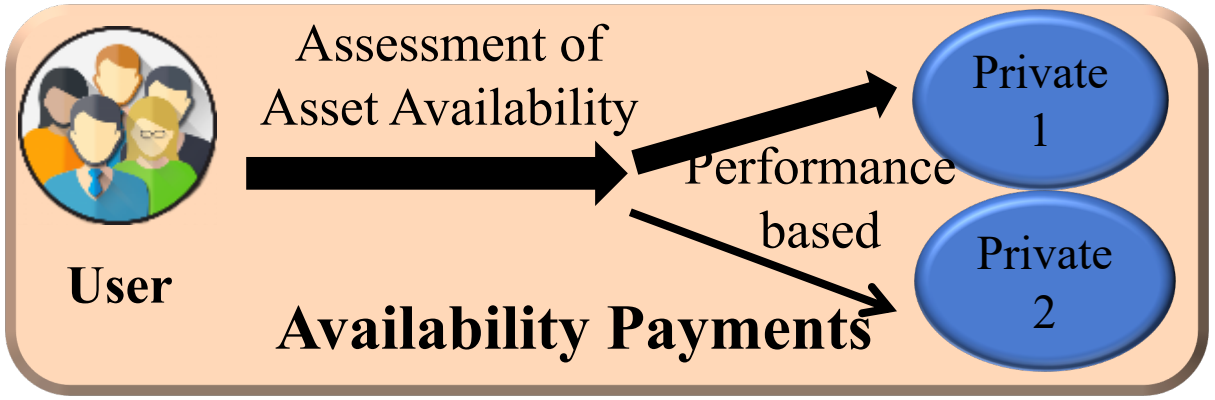
Reduced congestion in certain areas;

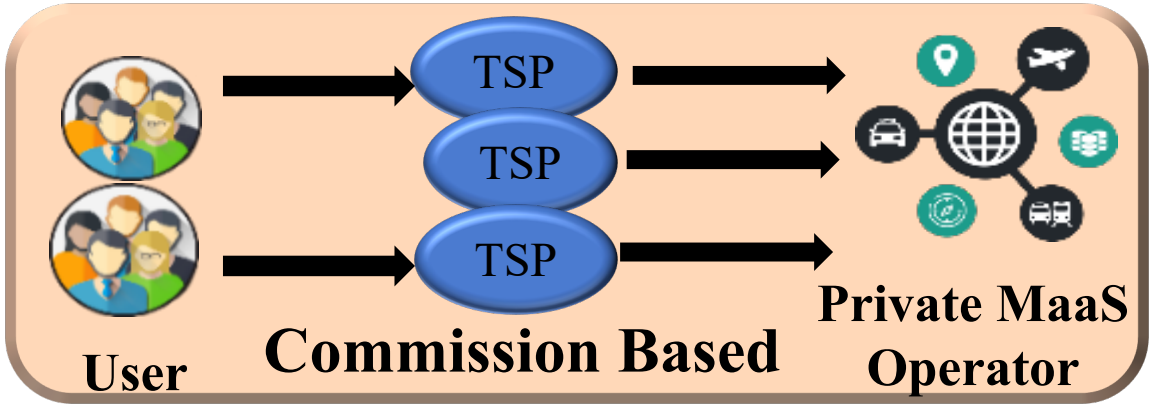
Promote use and increase ridership of under used services

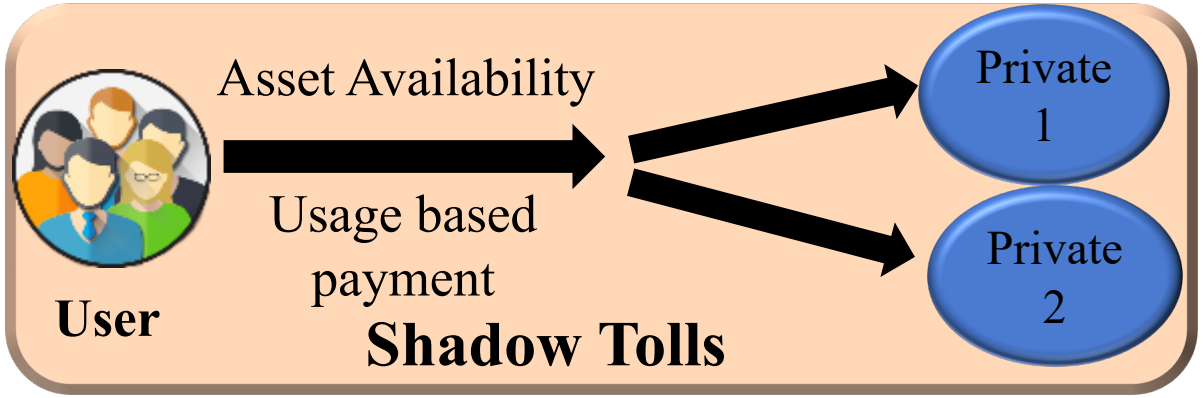
https://kingcounty.gov/depts/transportation/metro/fares-orca/what-to-pay.aspx https://www.transitchicago.com/howto/buying-fares/

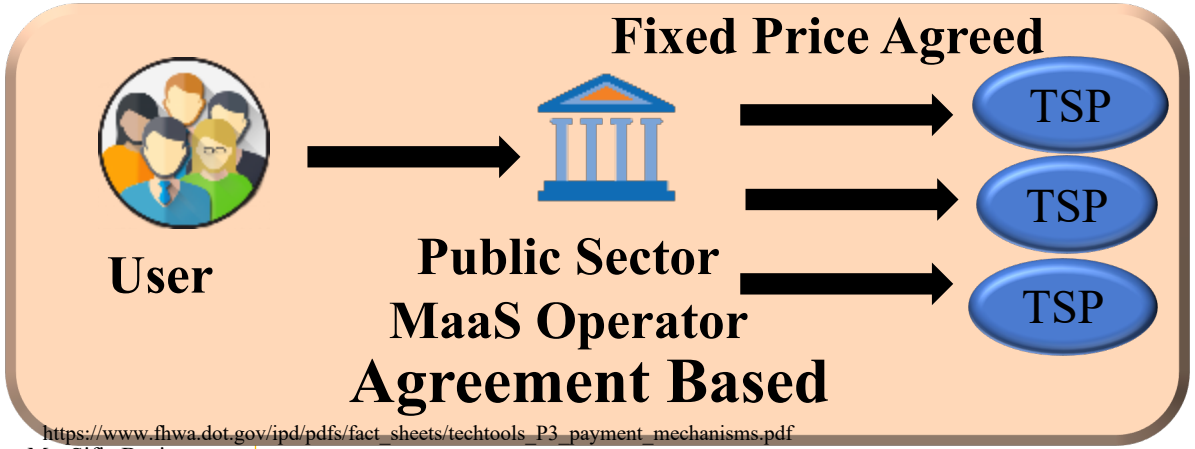
Revenue Allocation

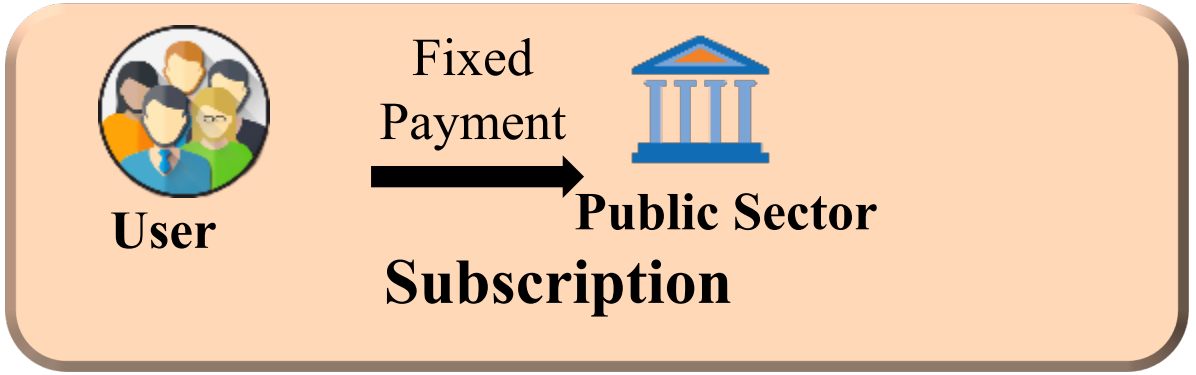










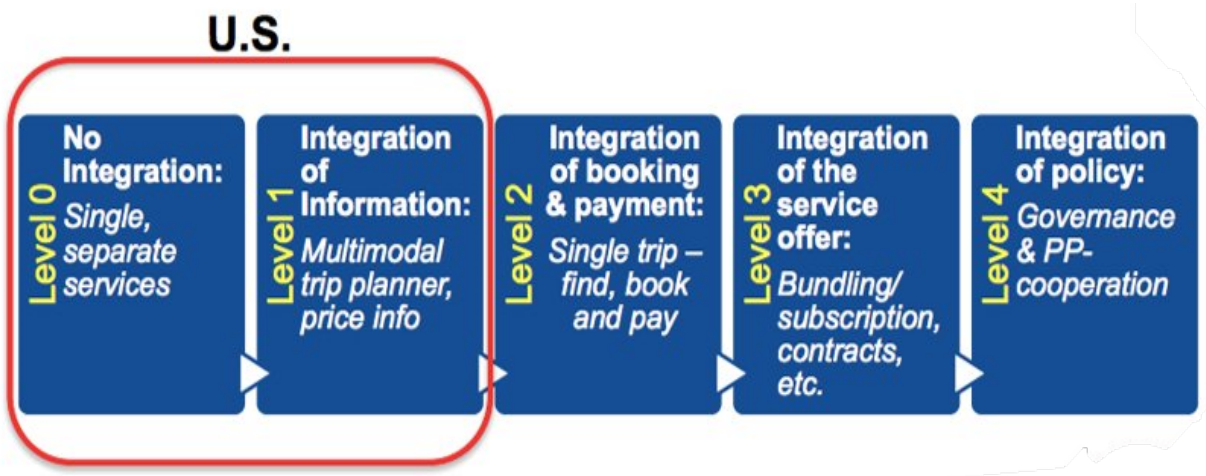


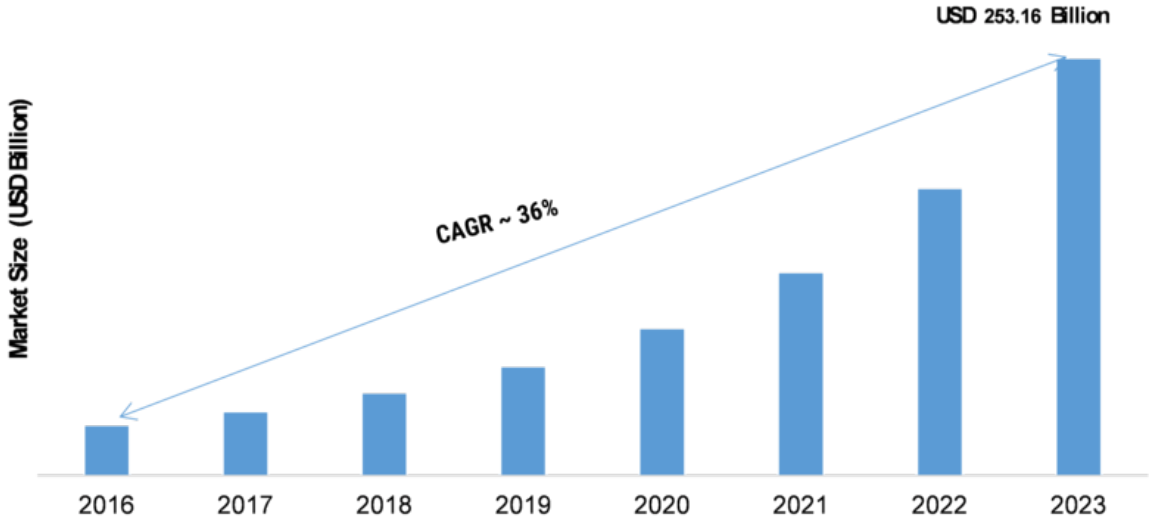
TSP **TSP: Transportation Service Provider**

https://www.fhwa.dot.gov/ipd/pdfs/fact_sheets/techtools_P3_payment_mechanisms.pdf

MaaSifie Business http://www.financingtransportation.org/pdf/p3-toolkit_risk_sharing_white_paper_1216.pdf

Market Analysis: Overall trends





The topology of MaaS

2023: Global MaaS market - USD 253.16 billion
2017-2023: 36% CAGR *(Compound Annual Growth Rate)*

Reference:
Jana Sochor, Hans Arby and MariAnne Karlsson. "The topology of Mobility as a Service: A tool for understanding effects on business and society, user behavior, and technical requirements". Paper No. EU-SP1013, 2017 ITS World Congress, Montreal.
Market Research Future. Global Mobility as a Service Market Research Report, 2019.

Market Analysis: Competitive analysis

Category	Example	Partnership
Public or Public-Adjacent Transportation Companies	MCTS, Bublr, Madison Bcycle, Running Inc.-shared ride taxi, etc.	**Collaborative partner:** These companies can help to **provide the necessary standardized data** for MaaS platform operation but **would not need to worry about the actual managing and operation** aspects of the platform.
Private On-Demand Ridesharing Companies	Uber and Lyft	**Competitor:** These companies would be the **sole operator of the Wisconsin MaaS platform** and would likely monetarily benefit from owning the platform. **Collaborative partner:** These companies would **lend their expertise as the operator** of the MaaS platform, but their ownership of the MaaS platform would be limited and **a more mutual partnership with open communication and greater benefit sharing** would occur.
Multimodal Transportation App Providers	Transit, CityMapper, Moovit, etc.	**Collaborative partner:** Their **transportation and technology integration expertise could be leveraged** as they could be the platform operator. They already have the knowledge and resources and would be a more neutral operator since they do not provide an actual physical transportation service.

Market Analysis: SWOT analysis of MaaS

Strength	Weakness
• Flexibility • Convenience • Transparency • Personalization • Promoting sustainable and health lifestyles	• Technology investment requirement • Equity • Funding
Opportunities	**Threats**
• Sustainable and intermodal travel options • Young talent to Wisconsin • Complimentary services • Equity • Cross-boundary solutions	• Partnership establishment Uncertainties with transportation service providers • Hard to change travel patterns and behavior • Subscription model • Privacy concerns

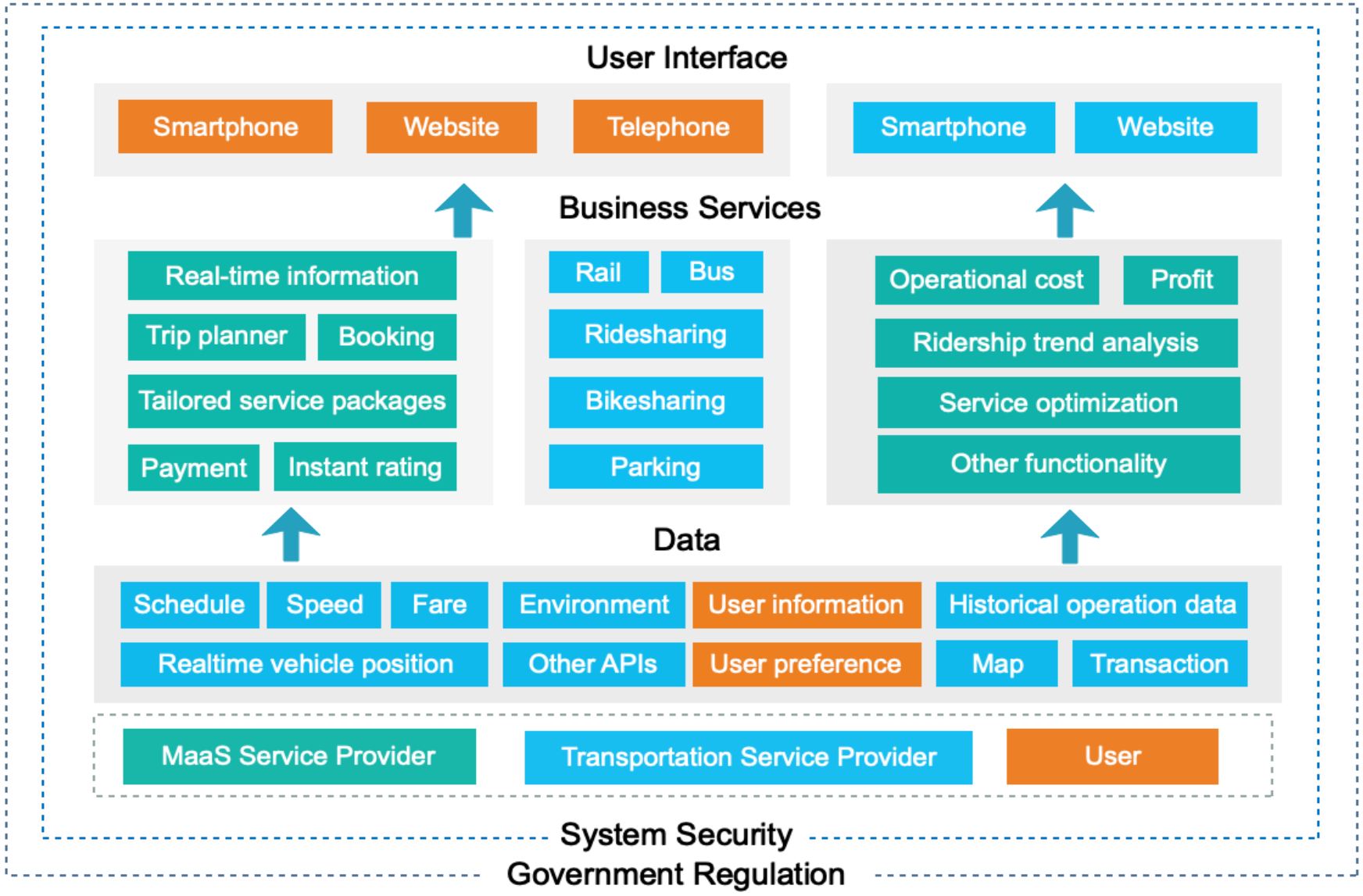
Market Analysis: Technology Assessment

- Relative Advantage: Maas provides real time information, alternative choices, payment systems. This should remove barriers for choice users and reduce uncertainty.
- Trialability: difficult to try, all or nothing system
- Observability: Benefits (i.e. usage) may be difficult to quantify
- Complexity: Easy to understand if a user friendly platform
- Cost to implement: Will require supporting infrastructure AVL, GPS, communications system
- Impact of failure? Public agencies are risk adverse and avoid early adoption

Market Analysis: User Assessment

- Target users: small urban area and rural public transport systems, 80 + systems in Wisconsin
- User characteristics: Customer focus, budget concerns, regulatory constraints, geographic limits, high visibility in public sector
- User Attitudes: generally open to change, trialability important, budget limits prevent risk taking, avoid early adoption
- User Capabilities: Need help implementing complex technology, staff shortage for innovations

MaaS System Architecture



Customers:

- Travelers (Users)
- Transportation Service Providers

Roadmap

Actors	Tasks	Phase I: Planning	Phase II: Launching	Phase III: Implementation
Government	Legal Environment	Resolve Equity issues (e.g., Aging and disabled, low-income families, etc.)		Monitor WMaaS Operators and TSPs
		Break out statewide cross-county barriers		
	Support Public Transportation usage	Build incentive plans to employers providing support to employees for public transportation		
		Build incentive plans to Transportation Service Providers for participating in WMaaS		
	Enhance data security and exchange technology	Set up statewide data security and open data regulations	Invest in the latest technologies for supporting MaaS	
	Finance	Identify and determine potential funding sources for support WMaaS		
	Public Awareness	Build up public awareness on WMaaS	Initiate public referendum on WMaaS	
	Research and Development	Conduct feasibility study on WMaaS		
MaaS Operator	Strategy	Develop WMaaS business models	Promote/Market WMaaS in public	
	Collaboration	Build up partnership among all the participants	Establish Business model with all WMaaS participants	Initiate MaaS Pilot Project(s)
	Service Integration		Integrate payment, routes and real time info	
	Revenue Allocation		Develop revenue allocation/share agreement	
	Customer satisfaction	Conduct customer preference survey and demand analysis		Perform service evaluation
Transporta-tion Service Provider (TSP)	Collaboration	Establish Agreements to enable data exchange , revenue allocation, service scope and security		
	Adaptation	Upgrade technology and infrastructure for WMaaS		
	Integration	Data standardization (Open data)		Exchange data

Future Research

Travelers in rural areas
Travel characteristics, business models, marketing strategies
Collaboration with current mobility services
Public or public-adjacent transportation companies, mobility-on-demand companies, multimodal transportation Apps, public V.S. private providers

Pilot projects
Urban, rural areas, inter-city/county services
Vehicle specifications
Recommendations for vehicle specifications to work with MaaS

Revenue and Fare collection system
Revenue allocation methods, digitized modes of user verification

Future Research

- We will consider additional projects of interest to the transit systems in Wisconsin
- Ideally where there is a consensus about the problem, a willingness to provide advice (i.e. service on an advisory committee) especially to help with problem definition, development of procedures, data collection and review of conclusions
- It is more likely that we can help if there is a possible source of funding, a wide agreement that the project is needed.
- Let us know your ideas??
  - Jie Yu <yu22@uwm.edu>
  - Edward Beimborn <beimborn@uwm.edu>

WMaaS: A Pilot Study at UWM Campus

Final Winner of Foxconn Smart City-Smart Future Competition
*(**12** out of **325** statewide participating teams)*

Q & A