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**

**Phase I: Background Analysis**
- Socio-demographic trends
- Economic challenges
- Technological advances

**1st Advisory Committee Meeting**

**Phase II: Problem Identification**
- Concept development
- Policy & planning
- Implementation issues

**2nd Advisory Committee Meeting**

**Phase III: System Development**
- Architecture design
- Roadmap design
- Market analysis

**3rd Advisory Committee Meeting**

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**ACKNOWLEDGEMENT**

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 manager, 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)

Whim, Finland
UbiGo, Sweden
Hannovermobil, Germany
Transit, US
Citymapper, US
Moovit, US

MaaS is Here Today!
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.

Source: Wisconsin Department of Administration Demographic Services Center, 2013
Wisconsin is different!

- Increase in working age group - demands Latest Technology

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

Source: https://www.bls.gov/eag/eag.wi.htm
Wisconsin is different!

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

Wisconsin is different!

Smartphone Availability

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

Households with a smartphone
- Less than 55%
- 55 - 65%
- 65 - 70%
- 70 - 75%
- Greater than 75%

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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County/city boundary
Legal criteria
Funding
Key findings

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

Aging and people with disabilities

- 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
Low-income travelers

- 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)

- 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

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

https://www.psta.net/programs/td-transportation-disadvantaged/
Less Temporally Efficient

Proportion of Time on Road
(In Revenue Service for PT)

Less Spatially Efficient

More Temporally Efficient

More Spatially Efficient

Passengers per Vehicle
(or per Unit Road Space)

Active Modes

Cost

High

Low

Private Transport

Ridesharing

Private Car

Private Autonomous Deadheading

Walking

Bike

Bikesharing

Fixed Route Minibus / Demand Responsive Transport/ Paratransit

Peer-to-Peer Microtransit (Uber X)

Peer-to-Peer Ridesourcing (Uber X)

Cycle Hire

Peer-to-Peer Car Sharing (Car Next Door)

Light Rail Transit

Bus (Rapid Transit/Frequent)

Bus (Coverage/Peak-Only)

Conventional Taxi

Fleet Car Sharing (GoGet/Car 2Go)

Fleet Microtransit (UberHOP)

Fleet Autonomous Taxi (Enoch/Uber/Google)

Private Autonomous Ridesourcing (Tesla)

Intermediate Modes

Public Transport

Fixed Route Minibus / Demand Responsive Transport/ Paratransit

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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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Implementation
• Data Issues
• Standardization
• Real-time availability
• Security
• Payment Integration
Key findings

- Agreements of possible Wisconsin Cross County Maas system Architecture

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

Key roles in MaaS Ecosystem

- Transportation service provider
- MaaS service operator/integrator

- Logistics service provider
- Government
- Travelers

Funding

- Potential business models of WMaaS

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)

Public transit operator
e.g. HANNOVERmobil in Germany

PPP
e.g. Yllas Around in Finland

Commercial: Reseller
e.g. UbiGo in Sweden

Commercial: Integrator
e.g. Whim in Finland

PPPP --- ongoing research for rural cases
Identification of Critical Issues

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  • Standardization
  • 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

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

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

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

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

**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

- **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).

Data Issues
- Standardization
- Real-time availability
- Security

- 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

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

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;

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
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:
## Market Analysis: Competitive analysis

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
<th>Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public or Public-Adjacent</td>
<td>MCTS, Bublr, Madison Bcycle, Running Inc.-shared ride taxi, etc.</td>
<td><strong>Collaborative partner:</strong> 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.</td>
</tr>
<tr>
<td>Transportation Companies</td>
<td></td>
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<tr>
<td>Private On-Demand Ridesharing</td>
<td>Uber and Lyft</td>
<td><strong>Competitor:</strong> These companies would be the sole operator of the Wisconsin MaaS platform and would likely monetarily benefit from owning the platform. <strong>Collaborative partner:</strong> 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.</td>
</tr>
<tr>
<td>Companies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multimodal Transportation App</td>
<td>Transit, CityMapper, Moovit, etc.</td>
<td><strong>Collaborative partner:</strong> 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.</td>
</tr>
<tr>
<td>Providers</td>
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</tbody>
</table>
# Market Analysis: SWOT analysis of MaaS

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
</table>
| • Flexibility  
  • Convenience  
  • Transparency  
  • Personalization  
  • Promoting sustainable and health lifestyles | • Technology investment requirement  
  • Equity  
  • Funding |

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
</table>
| • 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

<table>
<thead>
<tr>
<th>Actores</th>
<th>Tareas</th>
<th>Fase I: Planificación</th>
<th>Fase II: lanzamiento</th>
<th>Fase III: Implementación</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gobierno</strong></td>
<td>Legal Entornos</td>
<td>Resuelva cuestiones de equidad (por ejemplo, personas mayores y discapacitadas, familias de ingresos bajos, etc.)</td>
<td>Monitoreo de operadores y TSPs</td>
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<tr>
<td></td>
<td></td>
<td>Rompa los obstáculos de transporte a nivel estatal y transfronterizo</td>
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<td></td>
<td>Soporte Público de Transportación</td>
<td>Diga planes de incentivo a los empleadores que proporcionan soporte a los empleados para el transporte público</td>
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<tr>
<td></td>
<td></td>
<td>Diga planes de incentivo a los proveedores de servicios de transporte para participar en WMaaS</td>
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<td></td>
<td>Enhance Data Security and Exchange Technology</td>
<td>Establezca regulaciones y datos de seguridad a nivel estatal</td>
<td>Invierta en las últimas tecnologías para apoyar MaaS</td>
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<tr>
<td></td>
<td>Finance</td>
<td>Identifique y determine fuentes de financiación potenciales para apoyar WMaaS</td>
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<tr>
<td></td>
<td>Awareness</td>
<td>Crece la conciencia pública sobre WMaaS</td>
<td>Inicie el referéndum público sobre WMaaS</td>
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<tr>
<td></td>
<td>Research and Development</td>
<td>Realice un estudio de factibilidad sobre WMaaS</td>
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<tr>
<td></td>
<td>Strategy</td>
<td>Desarrolle modelos de WMaaS</td>
<td>Promueva/Merced WMaaS en el público</td>
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<tr>
<td></td>
<td>Collaboration</td>
<td>Construya un acuerdo con todos los participantes</td>
<td>Inicie el proyecto piloto del MaaS</td>
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<tr>
<td></td>
<td>Service Integration</td>
<td>Integre el pago, rutas y datos en tiempo real</td>
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<tr>
<td></td>
<td>Revenue Allocation</td>
<td>Desarrolle el acuerdo de asignación de ingresos</td>
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<tr>
<td></td>
<td>Customer Satisfaction</td>
<td>Realice un análisis de preferencia del cliente y demanda</td>
<td>Realice evaluaciones de servicio</td>
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<tr>
<td>MaaS Operator</td>
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</tr>
<tr>
<td></td>
<td>Collaboration</td>
<td>Diga acuerdos para facilitar la intercambio de datos, asignación de ingresos, alcance de los servicios y seguridad</td>
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</tr>
<tr>
<td></td>
<td>Adaptation</td>
<td>Actualice la tecnología e infraestructura para WMaaS</td>
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<tr>
<td></td>
<td>Integration</td>
<td>Estándarización de datos (datos abiertos)</td>
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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