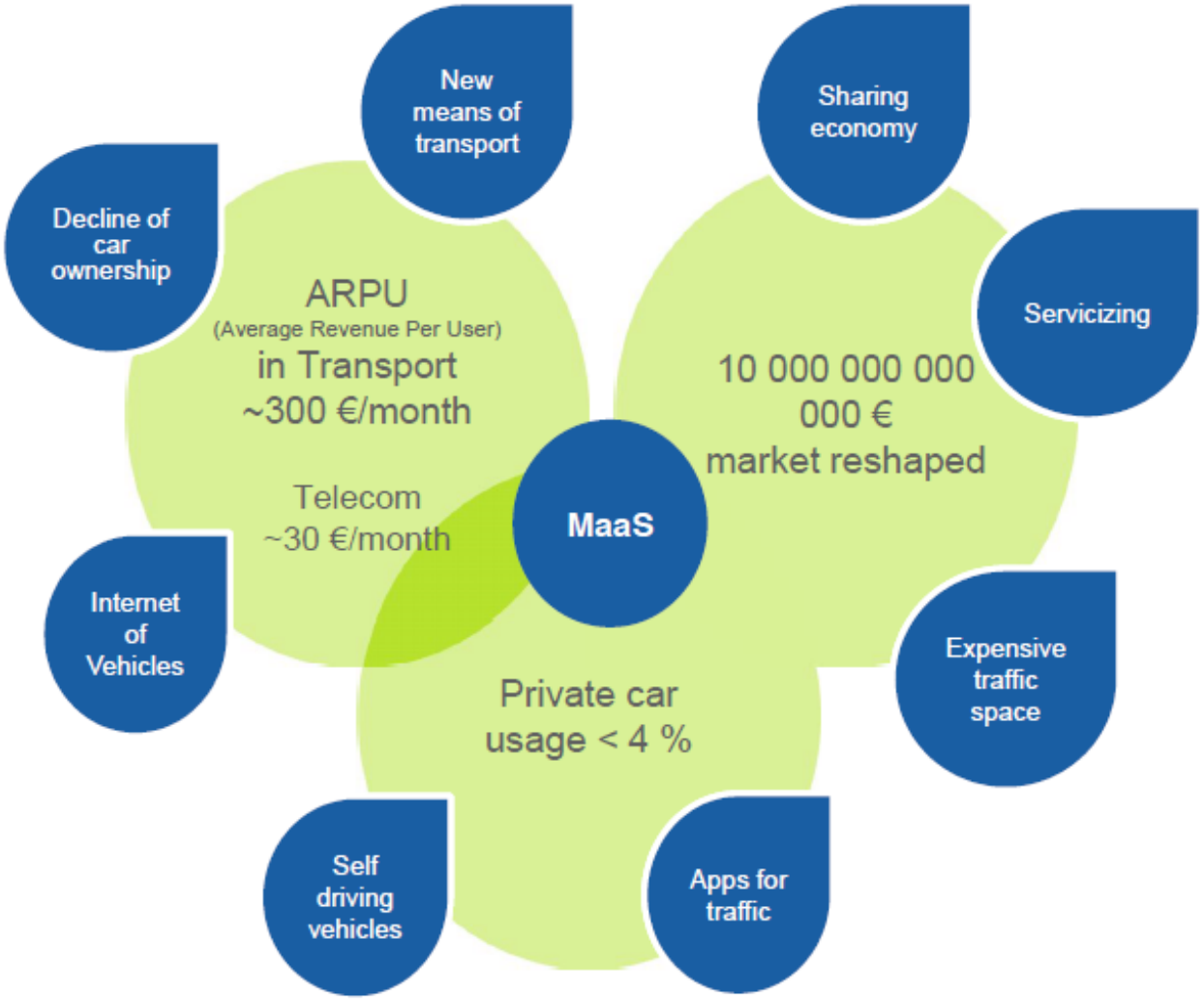
MOBILITY AS A SERVICE

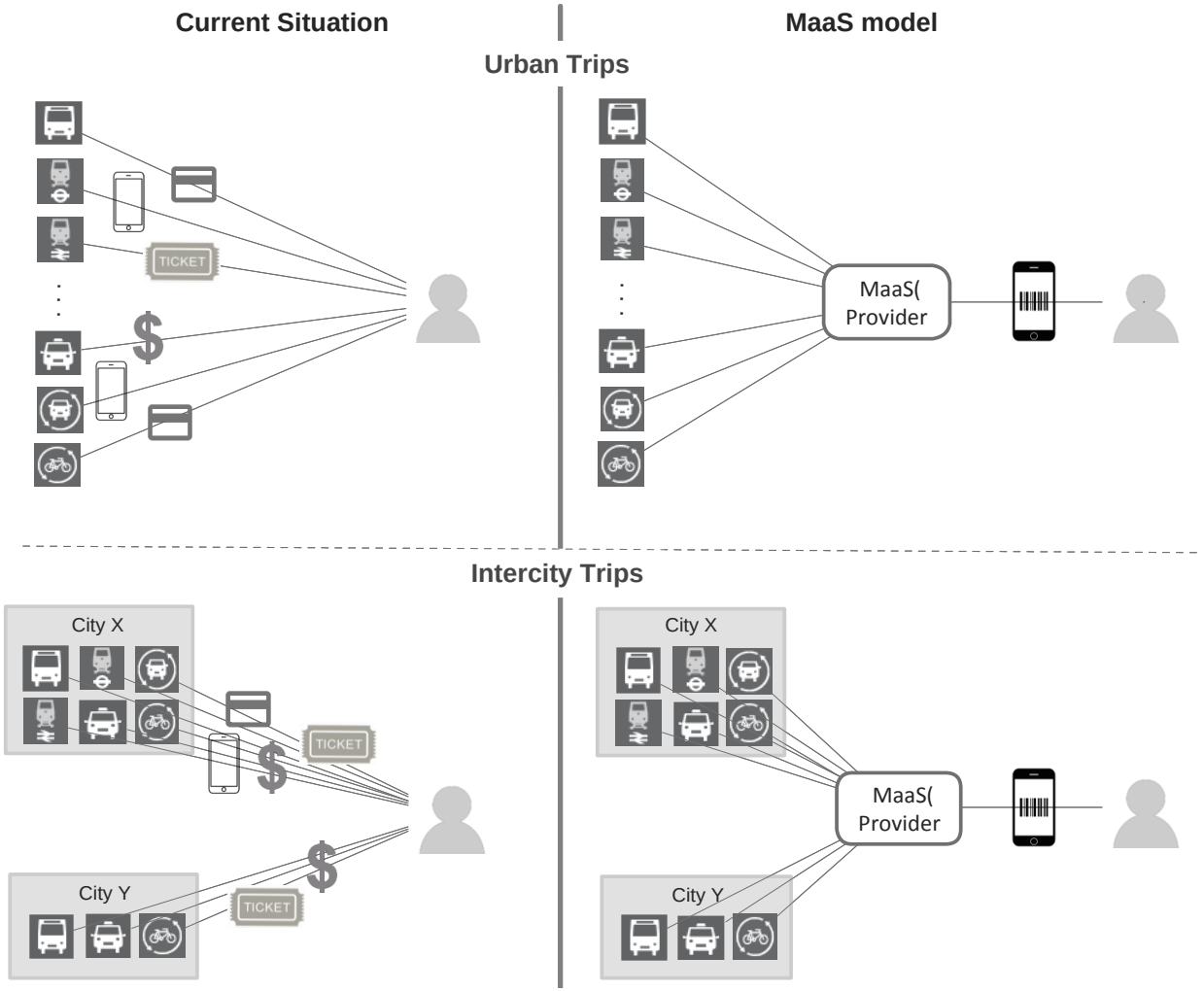
BME KÖZLEKEDÉSMÉRNÖKI ÉS JÁRMŰMÉRNÖKI KAR
32708-2/2017/INTFIN SZÁMÚ EMMI ÁLTAL TÁMOGATOTT TANANYAG

Situation


New means of transport
Sharing economy
Decline of car ownership
Servicizing
ARPU
(Average Revenue Per User)
in Transport
~300 €/month
10 000 000 000 000 €
market reshaped
Telecom
~30 €/month
MaaS
Internet of Vehicles
Expensive traffic space
Private car usage < 4 %
Self driving vehicles
Apps for traffic

Situation

Solution


Current Situation
MaaS model
Urban Trips
TICKET
$
MaaS(
Provider
Intercity Trips
City X
TICKET
$
City Y
TICKET
$
City X
MaaS(
Provider
City Y

Solution

Transport operators → MaaS Operator → Users


Multimodal Journey Planner


Real Time Information


Booking


Payment

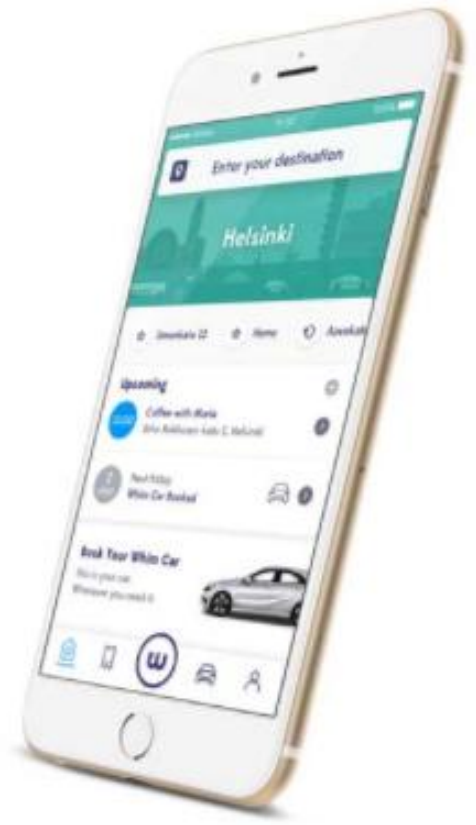

Getting on board / Ticket


User Account

Mobilty as a Service

History

- 2011: Transport Revolution report
- 2013: ITS strategy
- 2014: MaaS concept presented
- 2015: Transport Code
- 2015: creation of MaaS.fi
- 2016: change to MaaS.global
- 2017: launch of Whim app



Definition

- Mobility as a Service
- is a user-centric, intelligent mobility distribution model
- in which all mobility service providers' offerings are aggregated
- by a sole mobility provider, the MaaS provider,
- and supplied to users through a single digital platform. (Kamargianni and Mátyás, 2017)

Definition

- Mobility-as-a-Service (MaaS) is defined as
- a mobility distribution model
- in which a customer's transportation needs
- are met over one interface
- and are offered by a service provider.
  (Hietanen, 2014)

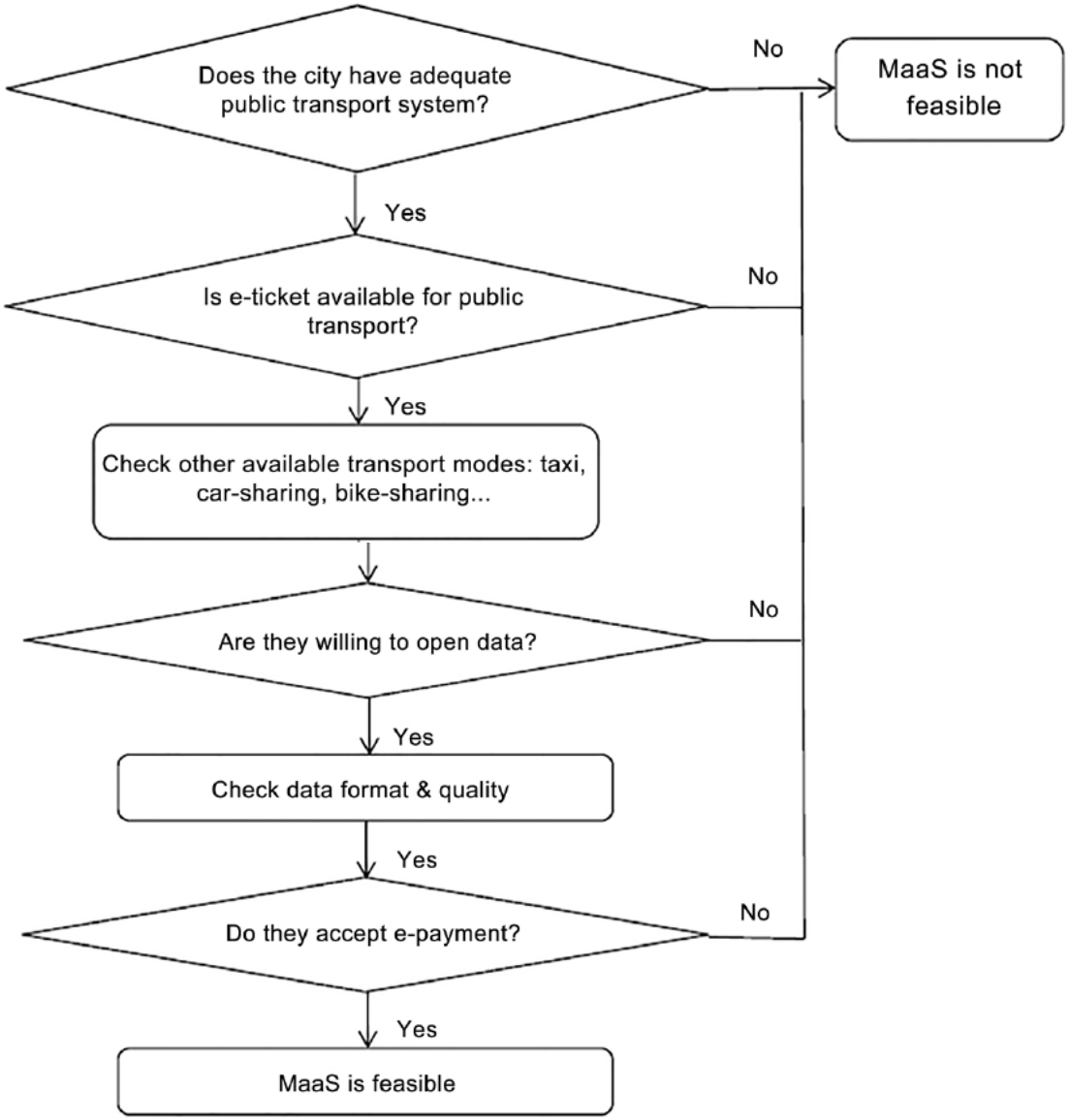
Definition

- Mobility as a Service (MaaS) is the integration of various forms of transport services
- into a single mobility service
- accessible on demand.
(ERTICO, 2016)

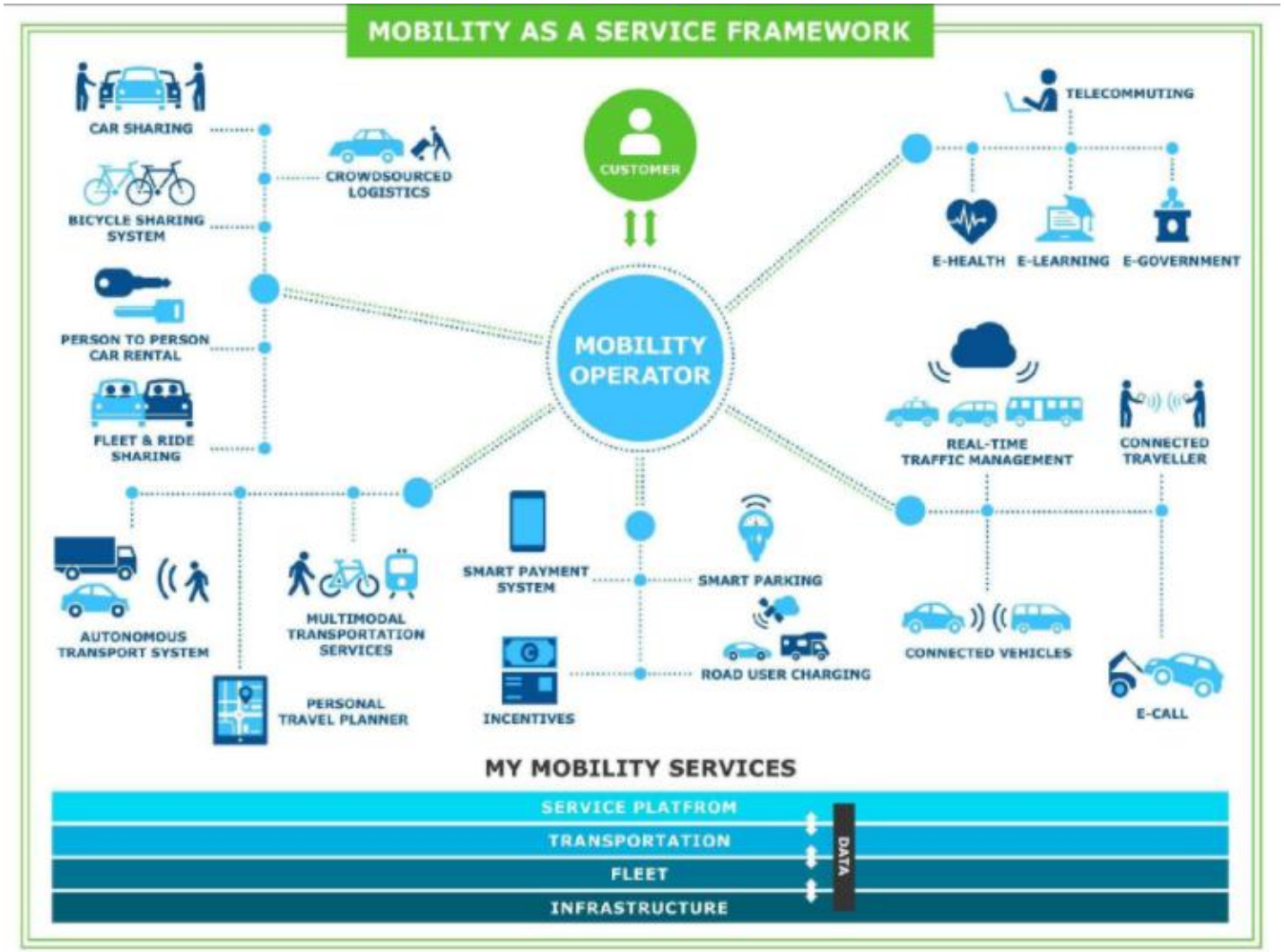
Definition

- Mobility as a Service (MaaS) is
- using a digital interface to manage the provision of transport related services,
- which meet the mobility requirements of the customers. (Transport System Capatult, 2016)

Feasibility check



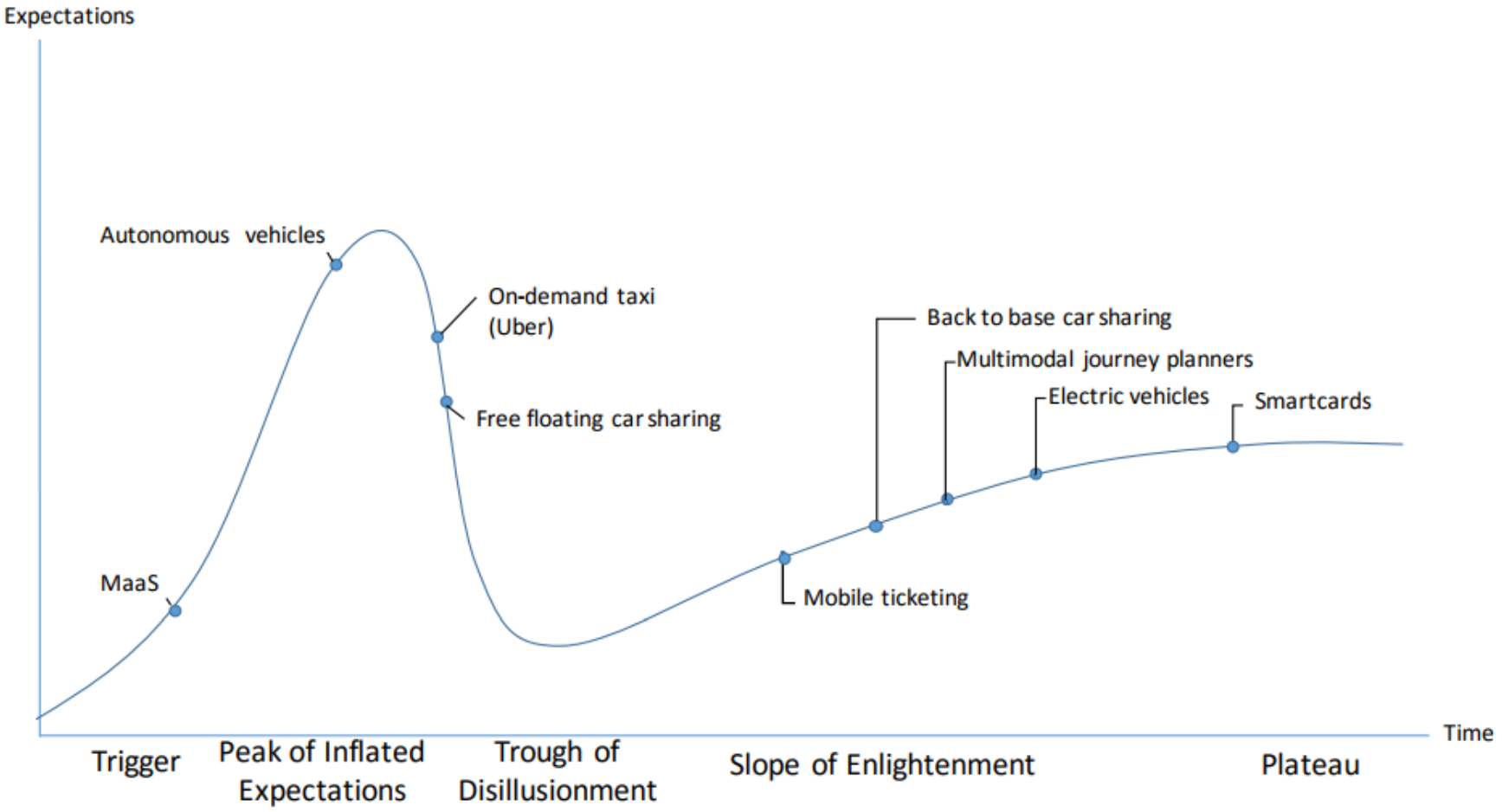
Framework


MOBILITY AS A SERVICE FRAMEWORK
CAR SHARING
BICYCLE SHARING SYSTEM
PERSON TO PERSON CAR RENTAL
FLEET & RIDE SHARING
CROWDSOURCED LOGISTICS
CUSTOMER
MOBILITY OPERATOR
TELECOMMUTING
E-HEALTH
E-LEARNING
E-GOVERNMENT
REAL-TIME TRAFFIC MANAGEMENT
CONNECTED TRAVELLER
AUTONOMOUS TRANSPORT SYSTEM
MULTIMODAL TRANSPORTATION SERVICES
PERSONAL TRAVEL PLANNER
SMART PAYMENT SYSTEM
SMART PARKING
INCENTIVES
ROAD USER CHARGING
CONNECTED VEHICLES
E-CALL
MY MOBILITY SERVICES
SERVICE PLATFROM
TRANSPORTATION
FLEET
INFRASTRUCTURE
DATA

Benefits

- **Integrated services:** the MaaS Operator creates a value proposition to the end user that comprises a 'bundle' of different mobility services
- **Personalized service:** based on user needs, including on demand services (e.g. car sharing)
- **Flexible payment:** mobility packages based on real usage
- **Optimization:** optimize demand and supply by knowing in real time the demand and the capacity of transport operators
- **Data sharing:** the MaaS Operator shares data on the mobility needs of customers, to help transport operators improve their service
- **Pontential market:** transport operators have the opportunity to access a wider market and increase their market share by having increased level of satisfaction of their customers

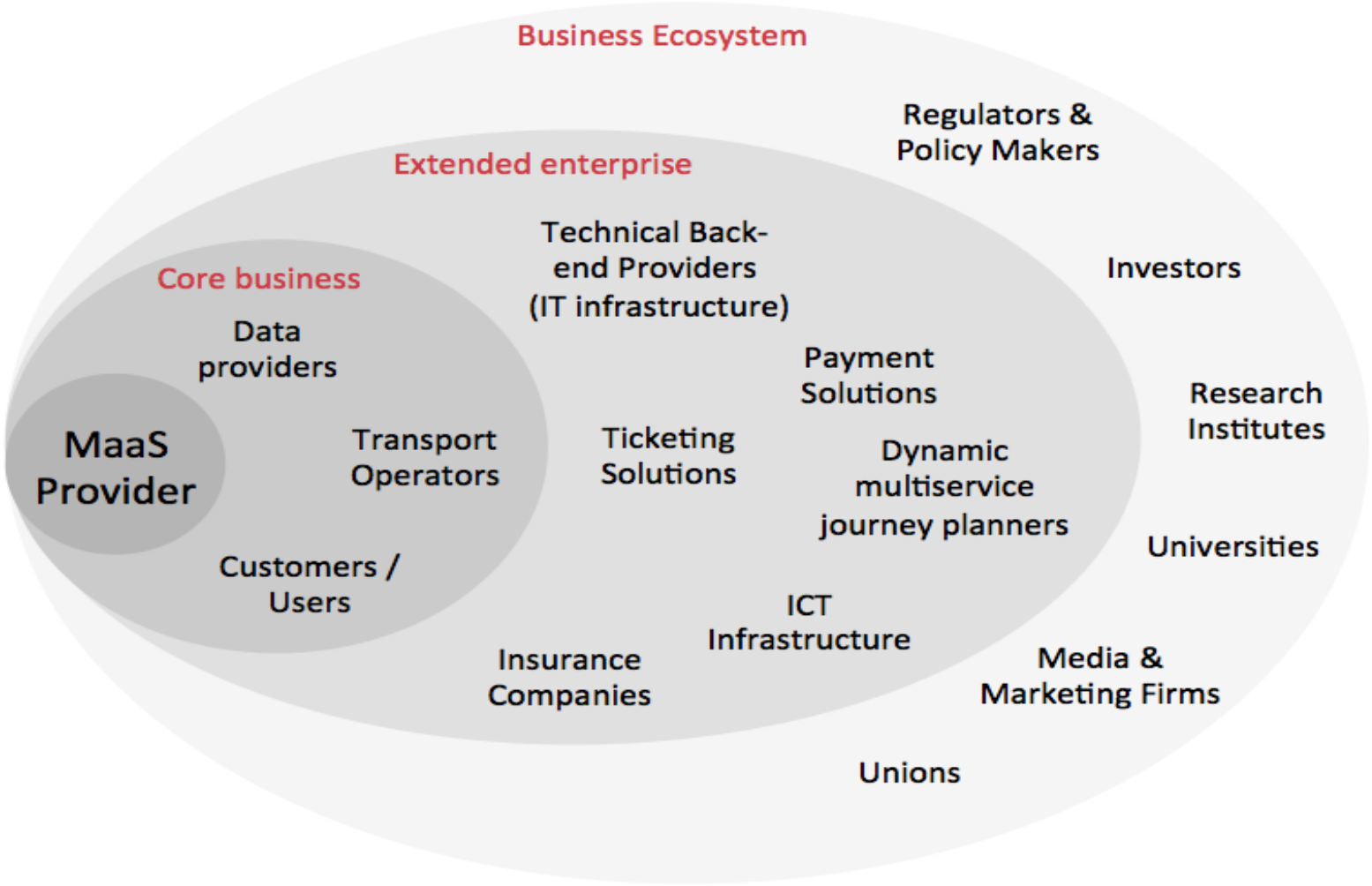
Hype cycle


Expectations
Autonomous vehicles
On-demand taxi (Uber)
Free floating car sharing
MaaS
Mobile ticketing
Back to base car sharing
Multimodal journey planners
Electric vehicles
Smartcards
Time
Trigger
Peak of Inflated Expectations
Trough of Disillusionment
Slope of Enlightenment
Plateau

Actors

- Political
  - specify regulations and policies to enable the MaaS market
- Mobility Service Providers (MSPs)
  - provide actual services
- MaaS Operator
  - new actor
  - bridge between MSPs and users
- End User
  - customers, but also data providers

Business ecosystem

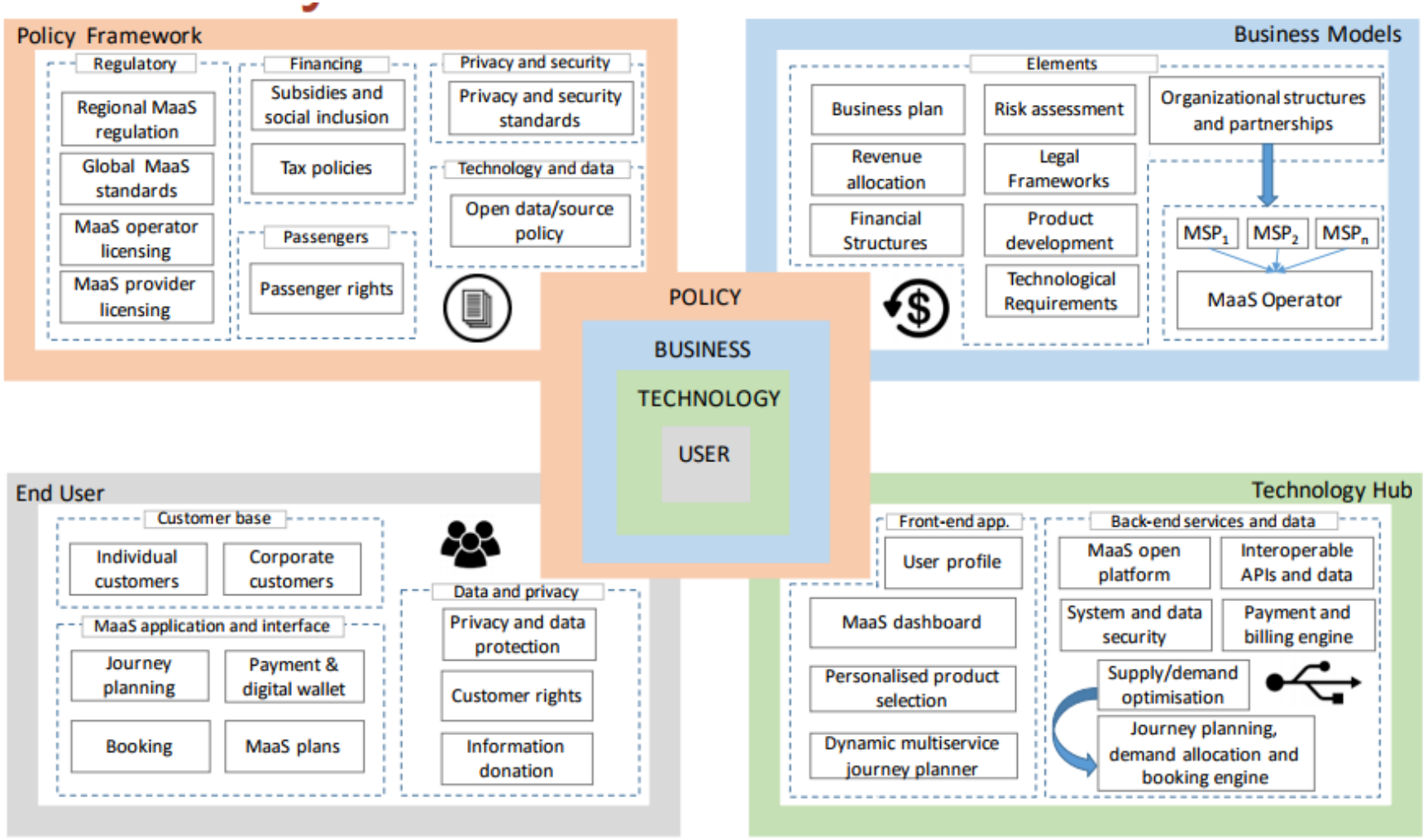


Role of MaaS Operator

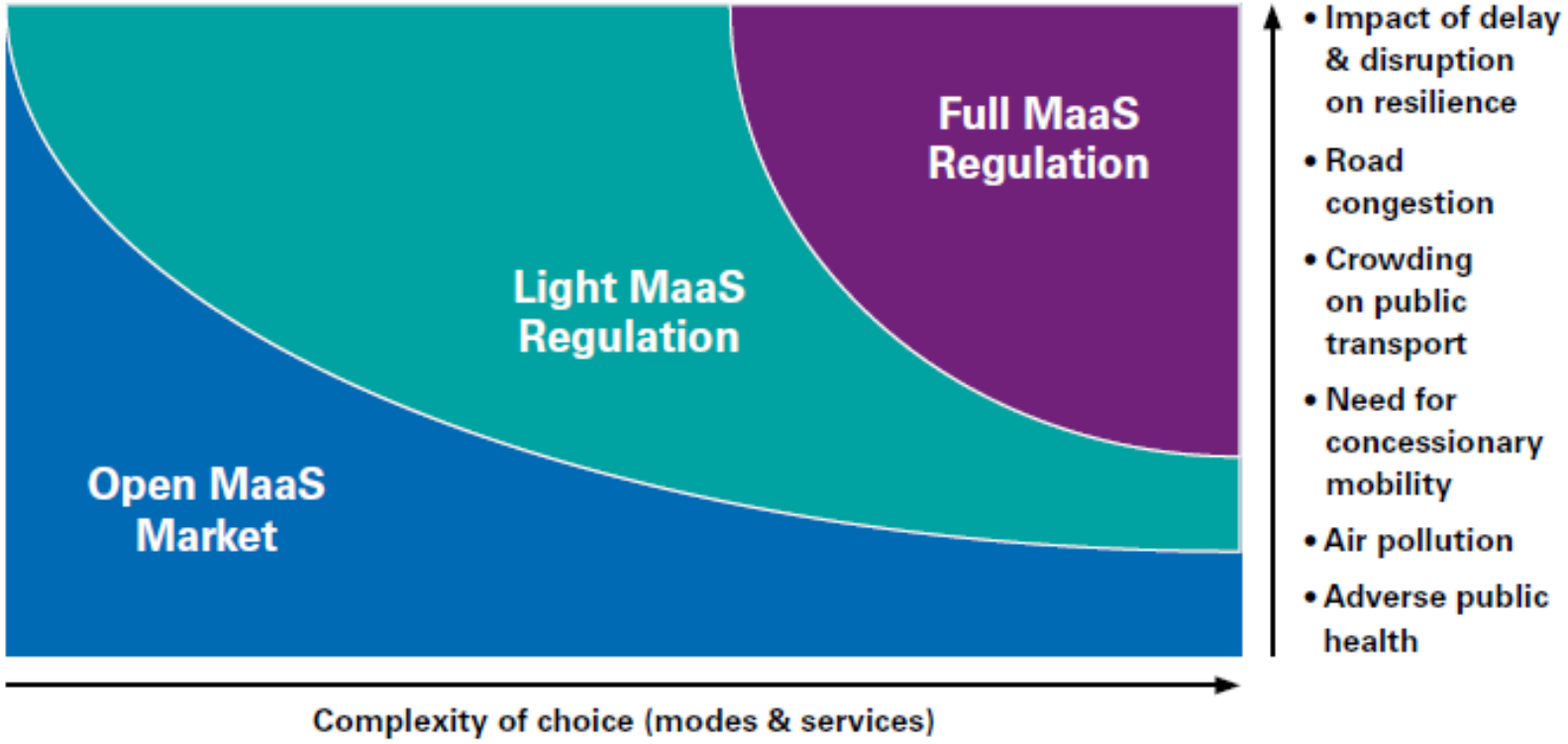
- Integrate supply and demand
- Provide services to the users
- Set up pricing models
- Make agreements with MSPs, end users and authorities

- Realization options:
  - transport authority
  - transport operator
  - private company

MaaS concept



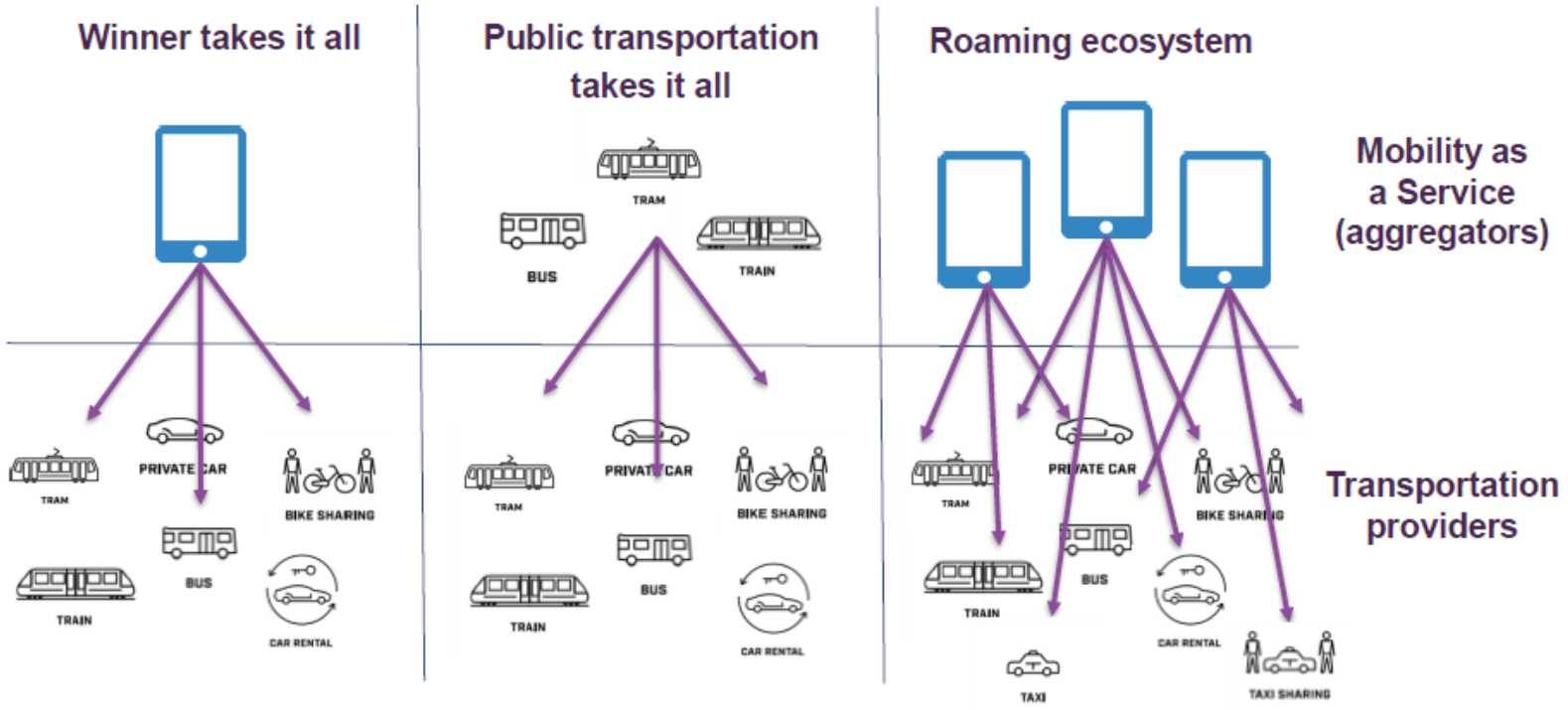
Regulation levels



Regulation levels

Governance & Regulation:	Permissive Management				Directive Control
MaaS Propositions / Products / Functionality:	Integrated Journey Planning	*Add* Integrated Payment Platform	*Add* Integrated "Choose and BooK" on-demand public & private mobility	*Add* Customer-optimised dynamic service management and route planning	*Add* Capacity-optimised dynamic service management and route planning
Scheme Architecture:	Open market with one or more MaaS providers working independently to address customer needs		Regulated market with one or more MaaS providers mandated to share data and APIs and adhere to ground rules set by the local/regional authority(ies)		Highly Regulated market with one MaaS aggregator which governs demand and supply across all public and private mobility services in the region*.
Public Authority capabilities required:	Regulatory oversight		*Add* Cross-modal Transport Modelling and Management		*Add* Technology Integration and Service Management, Data Sciences, Dynamic Network Management

Business models



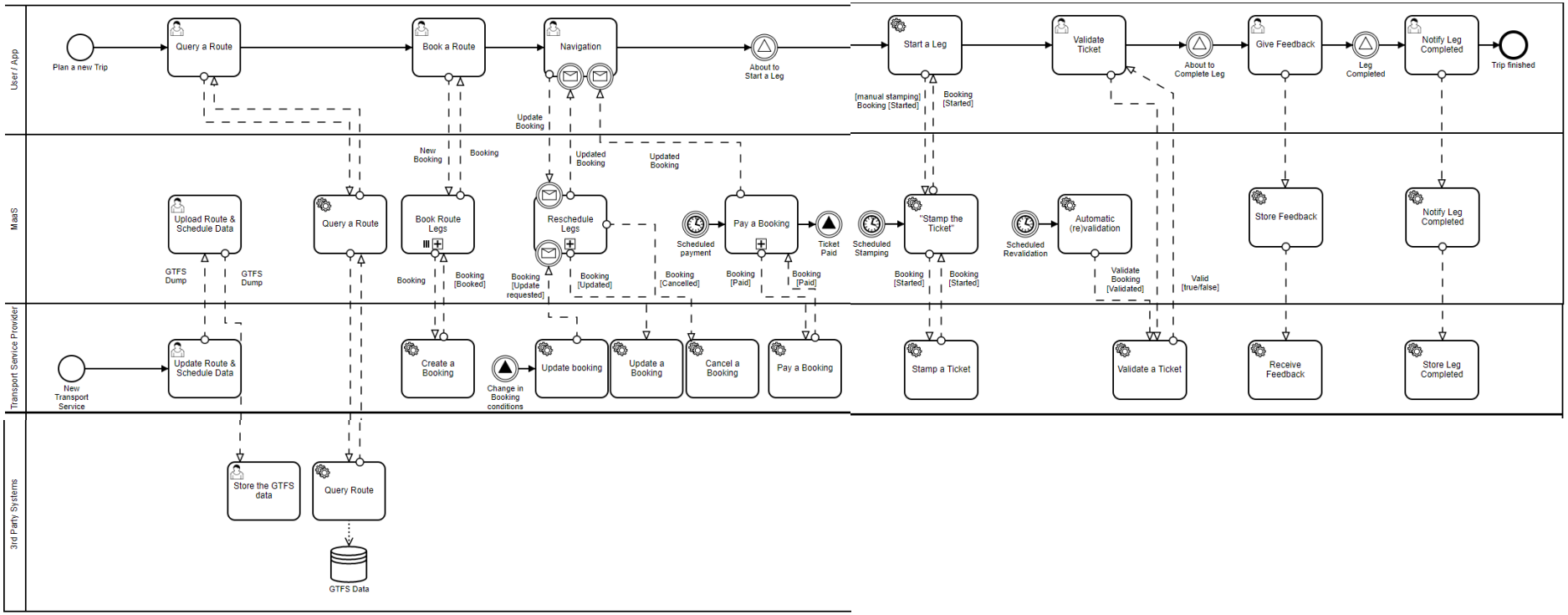
Technology

- Back-end analytics
  - supply and demand optimization in real time
  - synchronize data from different service providers
  - engines for analytics and reporting

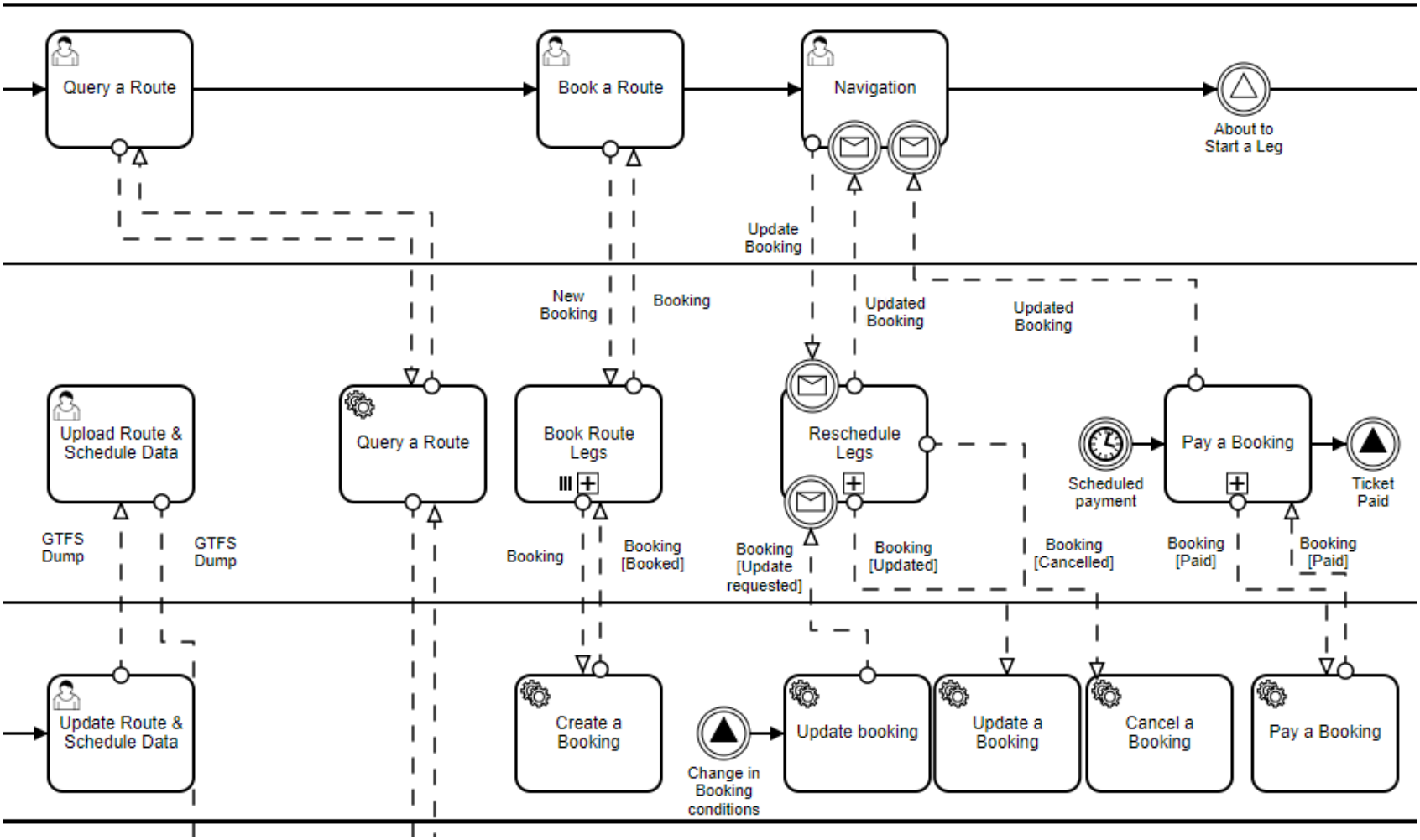
- Front-end interface and app
  - smartphone/web interface that users interact with directly
  - constant interaction with back-end
  - dynamic multiservice journey planner
  - feedback mechanism

Data flow

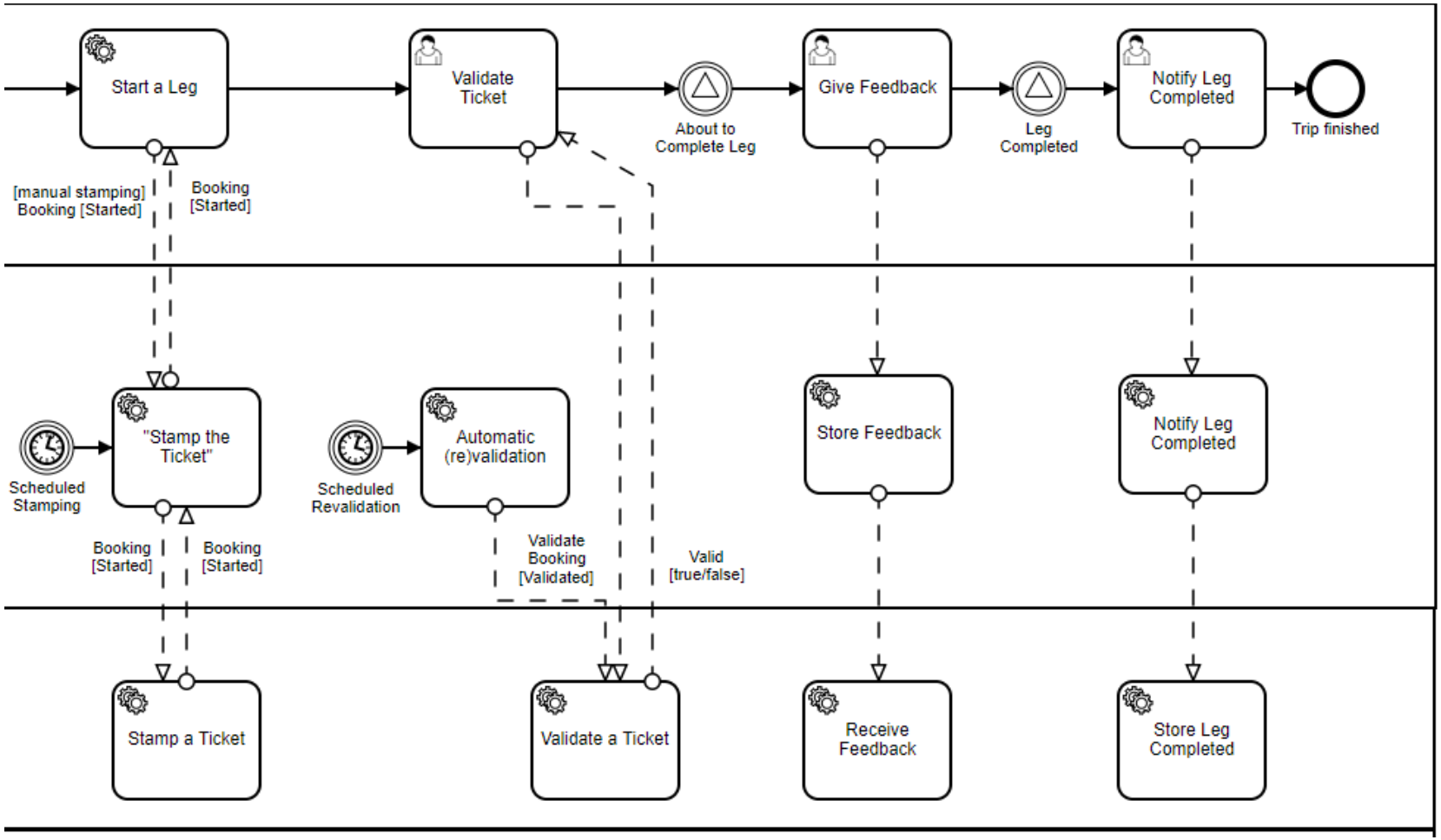
Planning Booking Navigation Payment Feedback



Data flow


Query a Route
Book a Route
Navigation
About to Start a Leg
Update Booking
New Booking
Booking
Updated Booking
Updated Booking
Upload Route & Schedule Data
Query a Route
Book Route Legs
Reschedule Legs
Scheduled payment
Pay a Booking
Ticket Paid
GTFS Dump
GTFS Dump
Booking
Booking [Booked]
Booking [Update requested]
Booking [Updated]
Booking [Cancelled]
Booking [Paid]
Booking [Paid]
Update Route & Schedule Data
Create a Booking
Change in Booking conditions
Update booking
Update a Booking
Cancel a Booking
Pay a Booking

Data flow


Start a Leg
Validate Ticket
About to Complete Leg
Give Feedback
Leg Completed
Notify Leg Completed
Trip finished
[manual stamping] Booking [Started]
Booking [Started]
"Stamp the Ticket"
Scheduled Stamping
Booking [Started]
Booking [Started]
Scheduled Revalidation
Automatic (re)validation
Validate Booking [Validated]
Valid [true/false]
Store Feedback
Notify Leg Completed
Stamp a Ticket
Validate a Ticket
Receive Feedback
Store Leg Completed

Data requirements

- Available Routes
- Stop information
- Vehicle positions
- Speed
- Vehicle information
- Transfer times
- Demand
- Environmental impact
- Ticketing

Travel parameters

- Urgency
- Speed
- Wallet
- Habits / Attitude / Skill

- Weather
- Route
- Luggage / Co-riders / Gear
- Physical Condition

Current mobility packages

Future mobility packages

Urban commuter package for 95 € / month:

- Free public transport in home city area
- Up to 100 km free taxi
- Up to 500 km rental car
- Domestic public transport 1500 km

15 minutes package for 135 € / month:

- 15 minutes from call to pick up by shared taxi
- EU wide roaming for shared taxi at 0,5 €/km
- Free public transport in home city
- Domestic public transport 1500 km

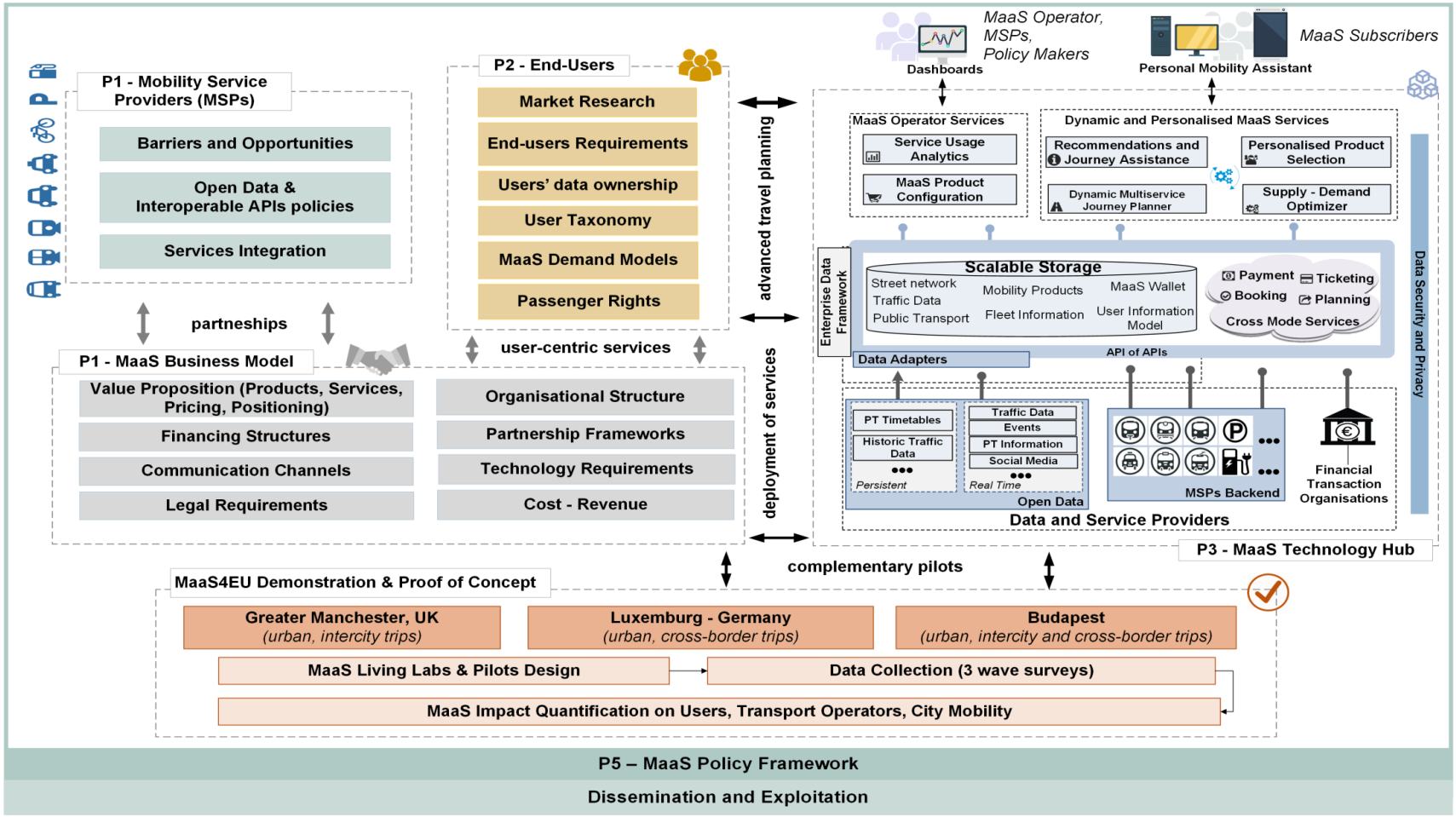
Business world package for 800 €/month:

- 5 minutes pickup in all EU
- Free taxi in home city
- Lease car and road use
- Taxi roaming worldwide

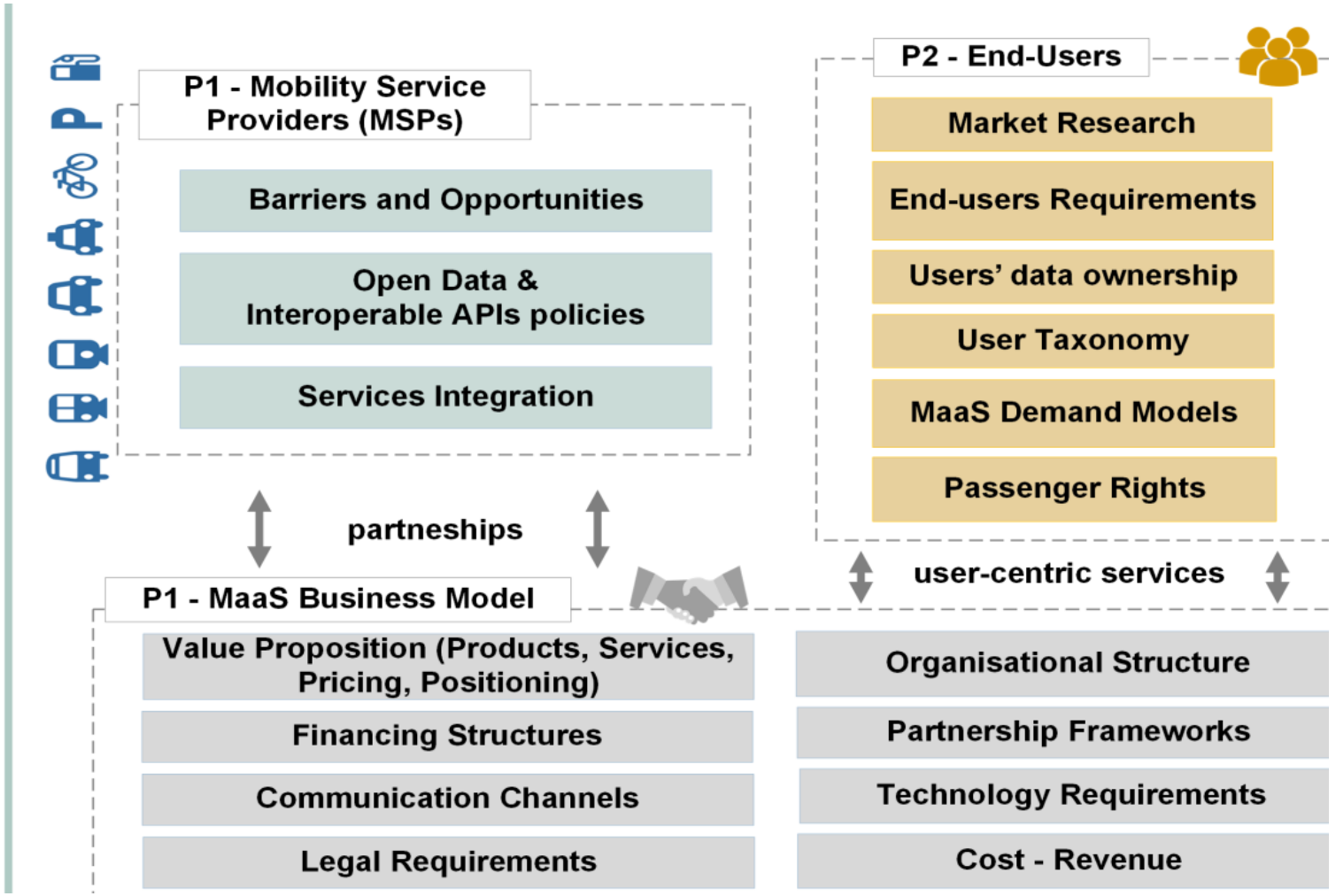
Family package for 1 200 €/month:

- Lease car and road use
- Shared taxi for all family with 15 minutes pickup
- Home city public transport for all
- Domestic public transport 2 500 km

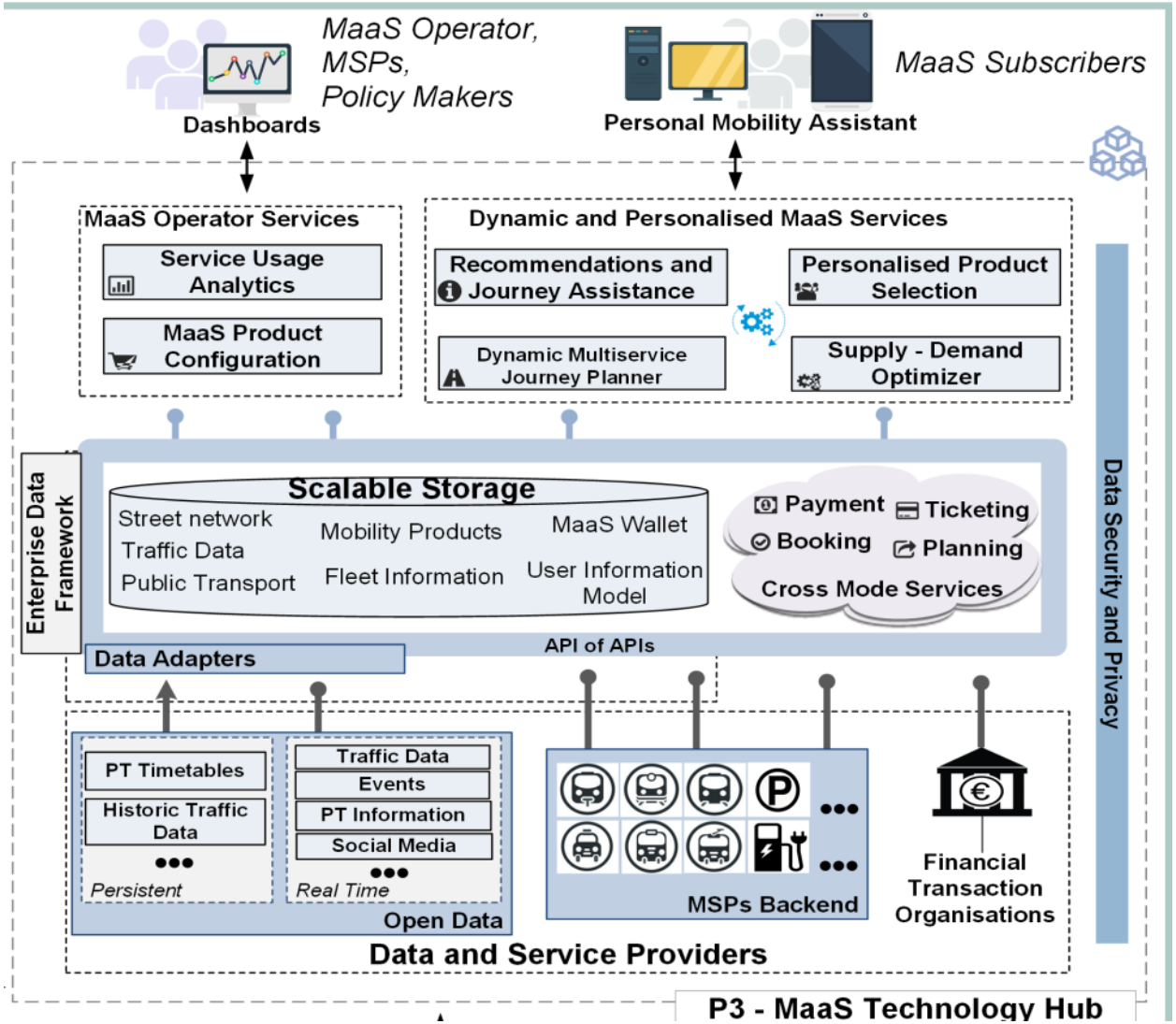
MaaS approach



MaaS approach

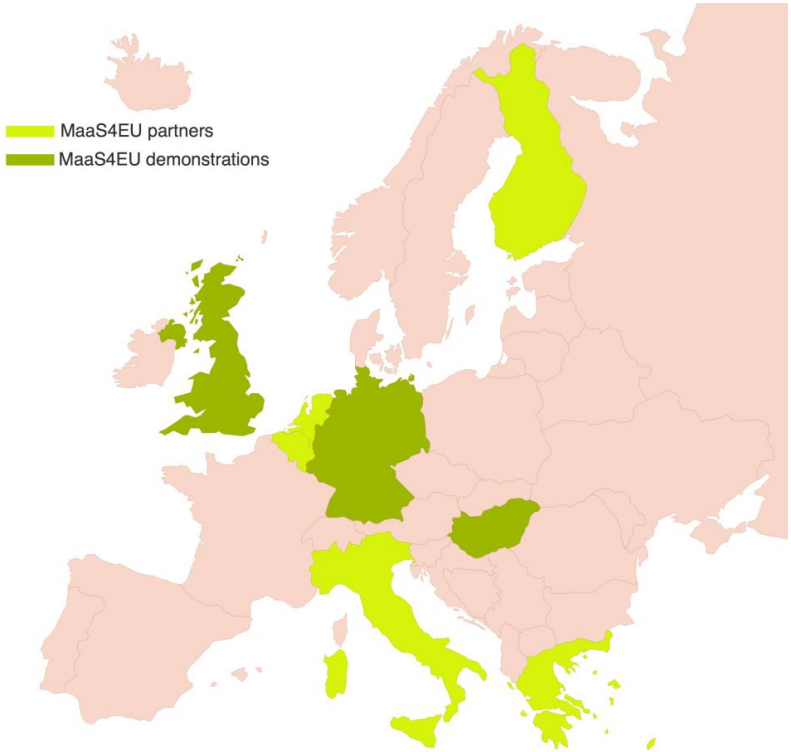


MaaS approach



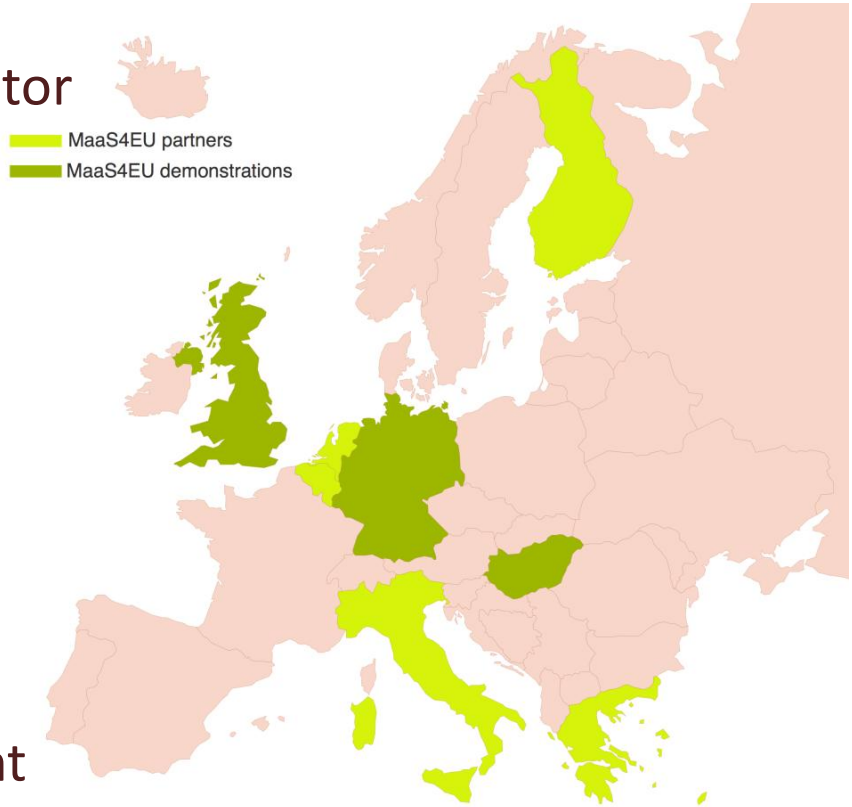
Pilot

- Greater Manchester
  - urban and intercity trips
  - locals and tourists
  - TFGM is the MaaS operator
- Luxembourg – Germany
  - cross-border and urban trips
  - locals
  - SLA is the MaaS operator
- Budapest
  - urban and cross-border trips
  - locals and tourists
  - Toll Service is the MaaS operator

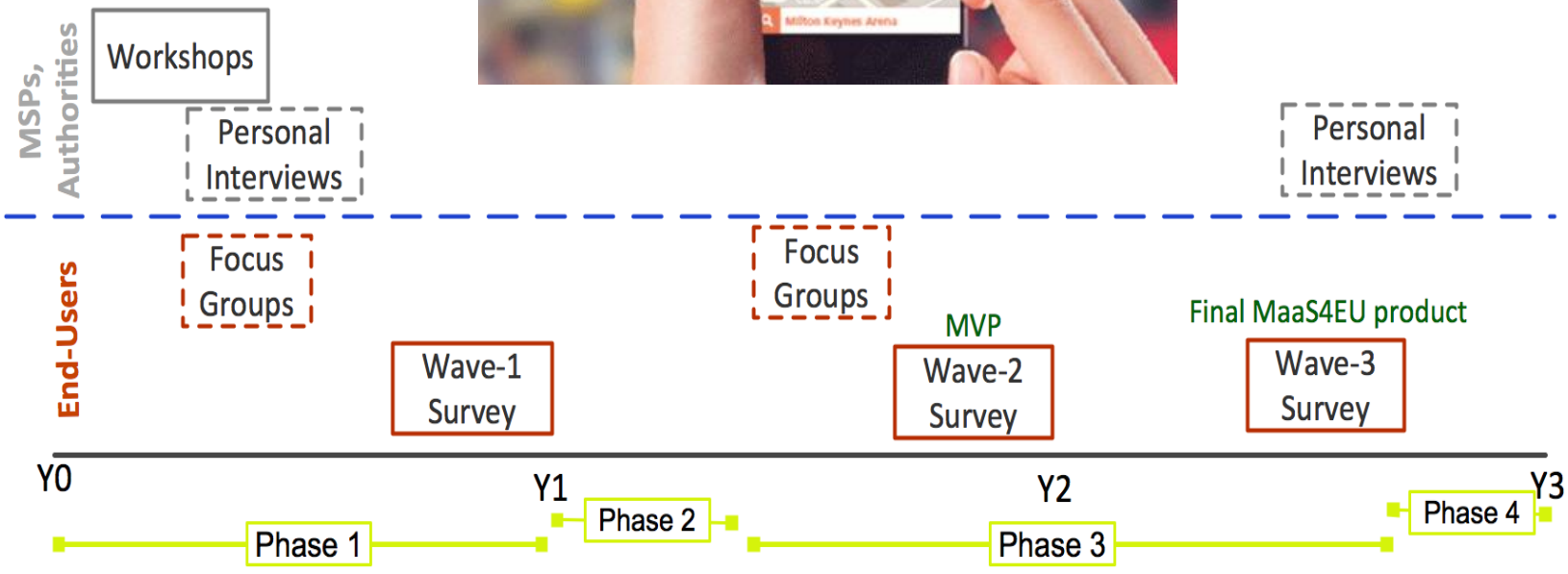


Pilot

- Budapest
  - urban and cross-border trips
  - locals and tourists
  - Toll Service is the MaaS operator
- Participants
  - BKK: bus, metro, tram
  - Mol BuBi: bikes-sharing
  - Taxi: on demand
  - MÁV-Start: railway
  - Oszkár: ride sharing
  - GreenGo: car sharing
  - NFM: ministry of development
  - KTE: transport association



Data collection



Expected benefits

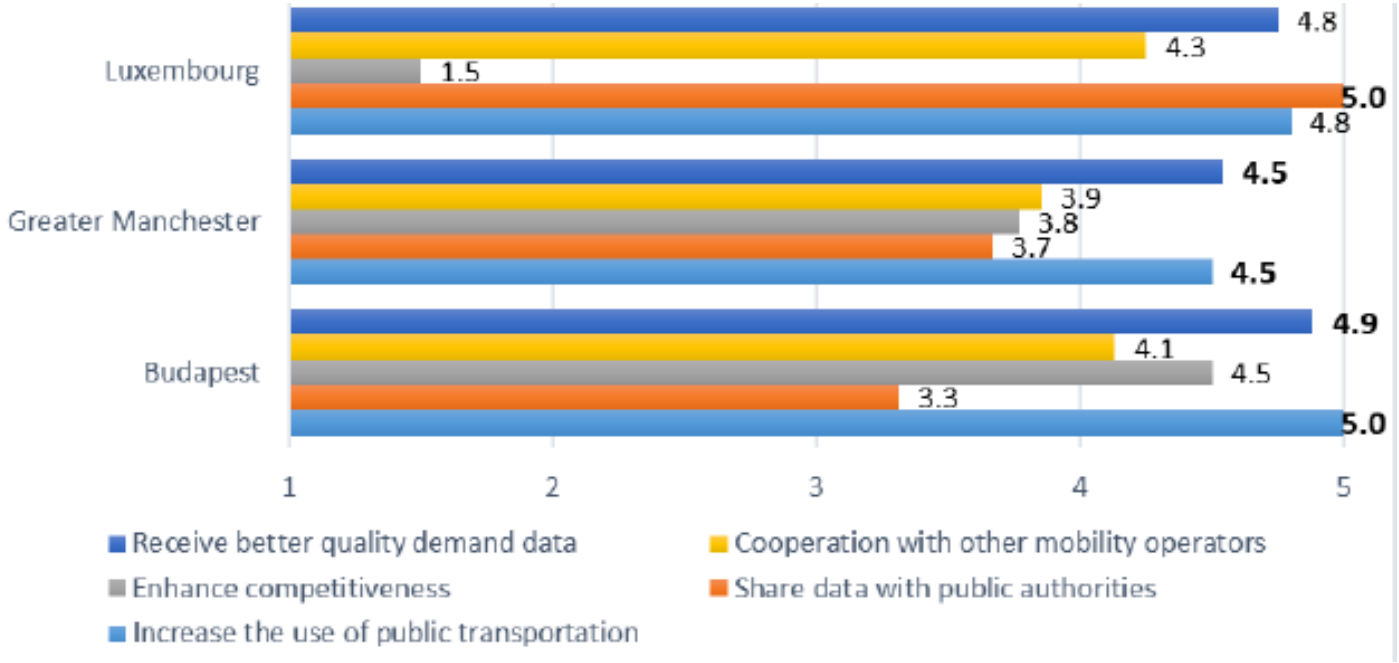
- Possible choices:
  - 1) Reduction of transportation costs for end users
  - 2) Optimization of existing public transport options
  - 3) Increase of supply of transport options (e.g. on demand services)
  - 4) Reduction of car ownership
  - 5) Reduction of congestion
  - 6) Improvement of air quality
  - 7) Increase of citizen travel satisfaction

Expected benefits

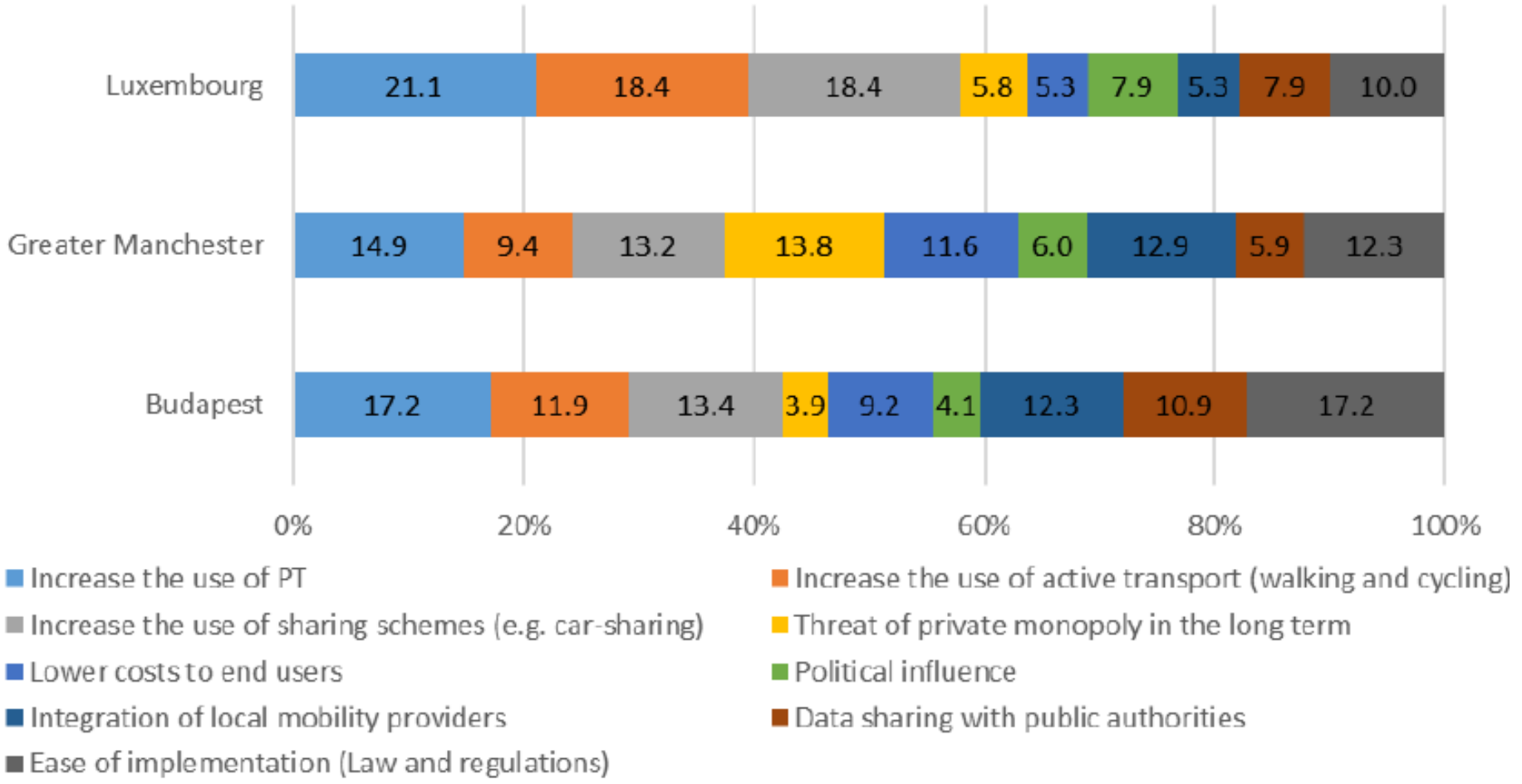
- Budapest:
  - optimization of existing public transport options,
  - increase of citizens' travel satisfaction,
  - not agreed whether the MaaS scheme would significantly reduce car ownership and congestion,
  - benefits depend on the selected business model.
- Greater Manchester:
  - potential benefits depend on many factors: the existing situation, how MaaS is implemented, how mobility packages are designed, the price they are sold,
  - increase of citizens travel satisfaction,
  - optimization of existing public transport options,
  - reduction of transportation costs for car users shifting mode to MaaS could represent a high cost saving,
  - it cannot be assumed that MaaS can have a significant impact on car ownership reduction and, consequently, on congestion and emissions.
- Luxembourg:
  - increasing transport options/alternatives offered is the most significant benefit,
  - not expected to contribute to the reduction of transportation costs for the end-users.

Expected benefits

- private MSPs: increase of revenues and increase of market share,
- small operators: more interested in joining to gain more visibility and create partnership with bigger players,
- large MSPs: receiving better quality demand data is a strong motivator.



Expected benefits



Criteria of successful implementation

- Service reliability
- Real time information
- Privacy
- Include all transport modes available in the city
- Integrate other services apart from mobility services
- Loyalty rewards
- Secure payment options
- Promote use of public transport
- Provide data back to the involved actors

Criteria of successful implementation

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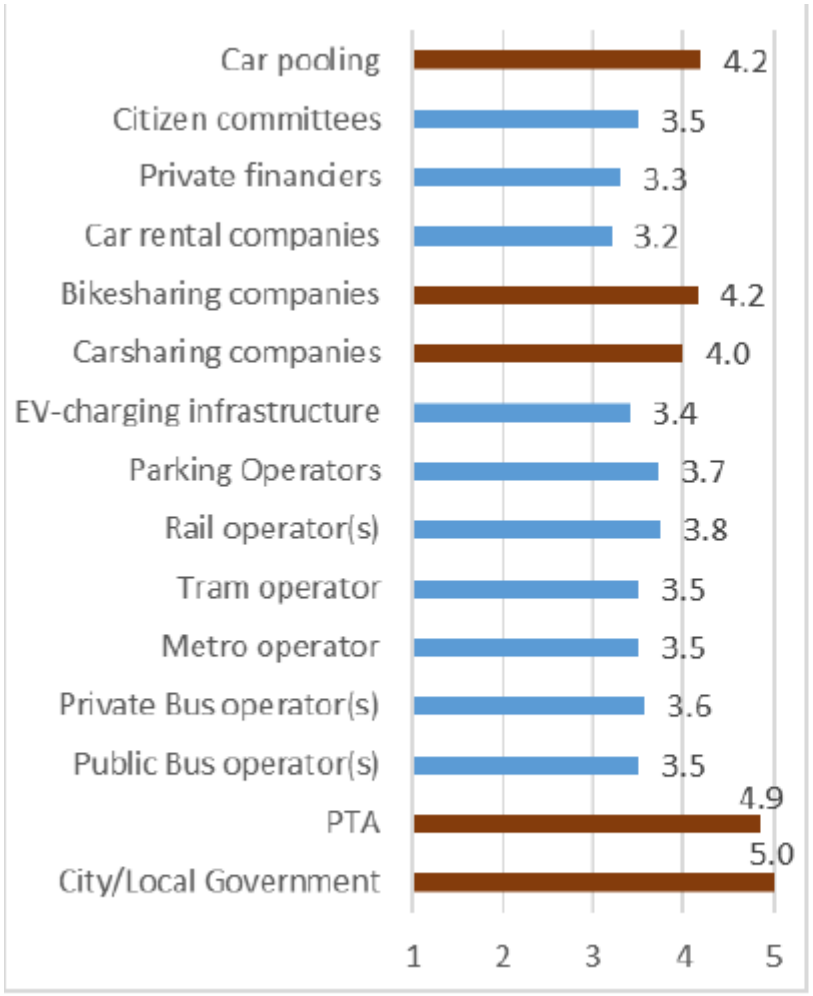
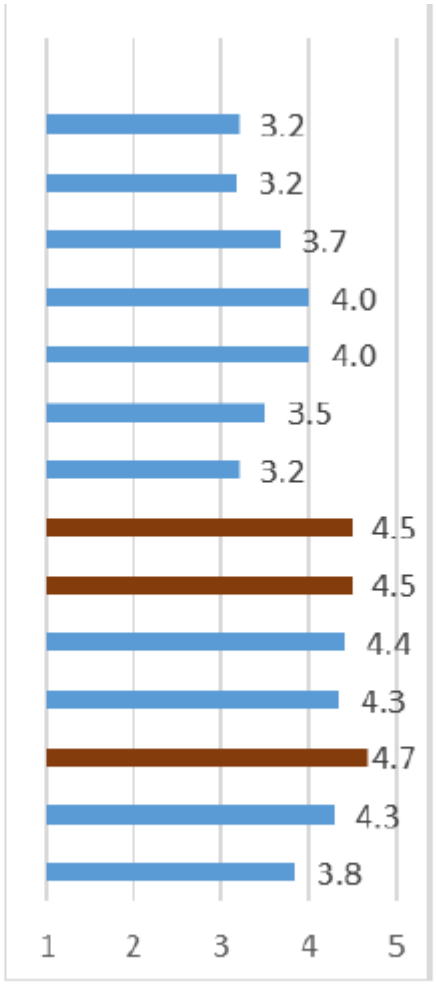
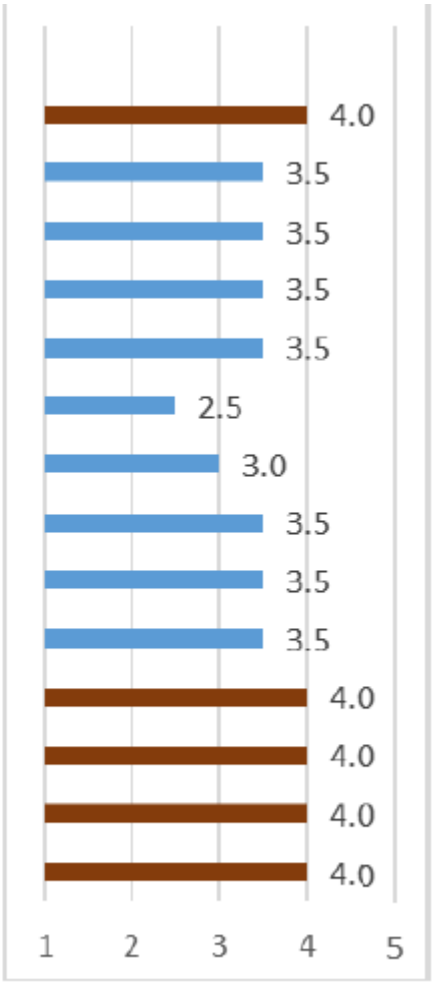
Important actors



(a) Budapest

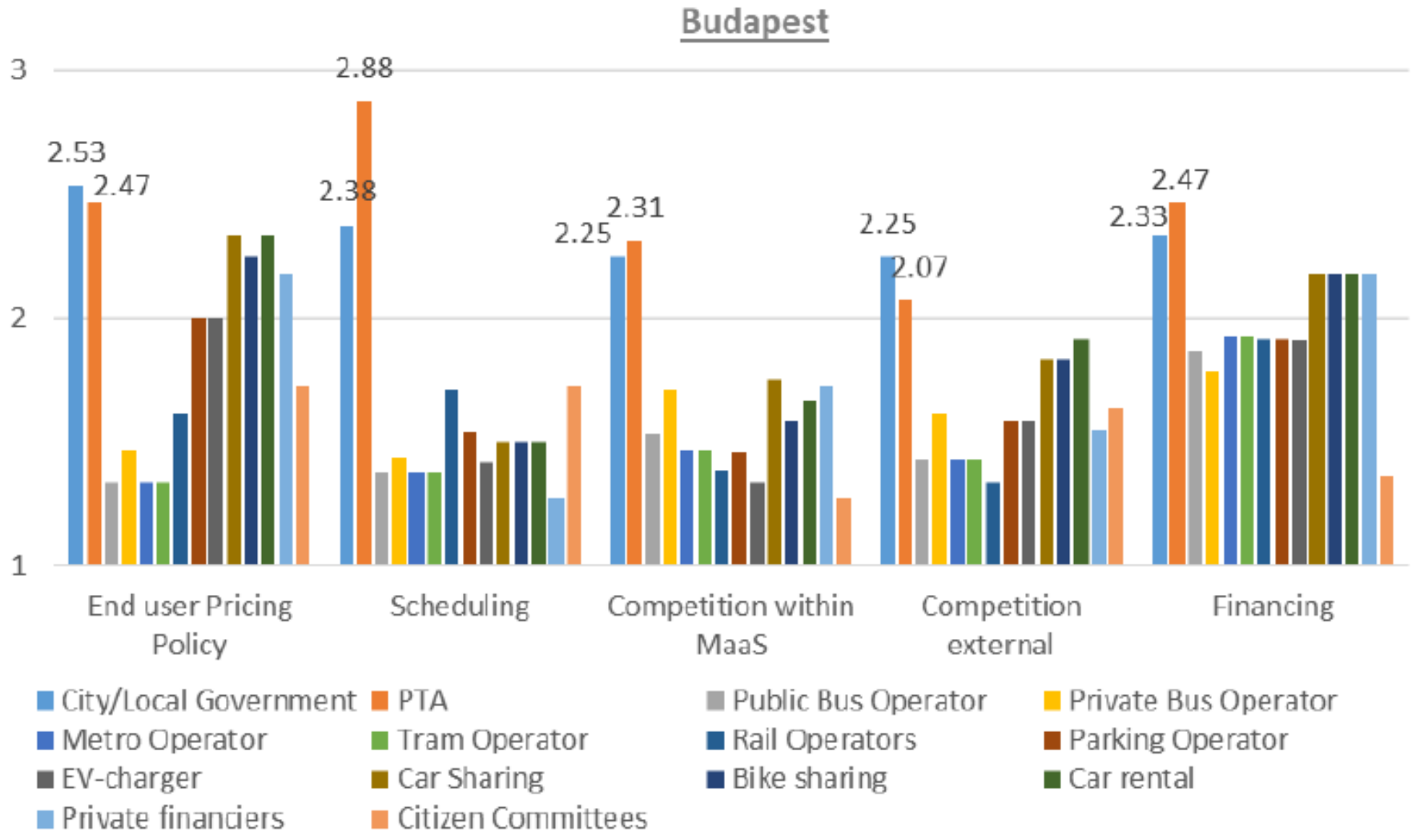


(b) Greater Manchester

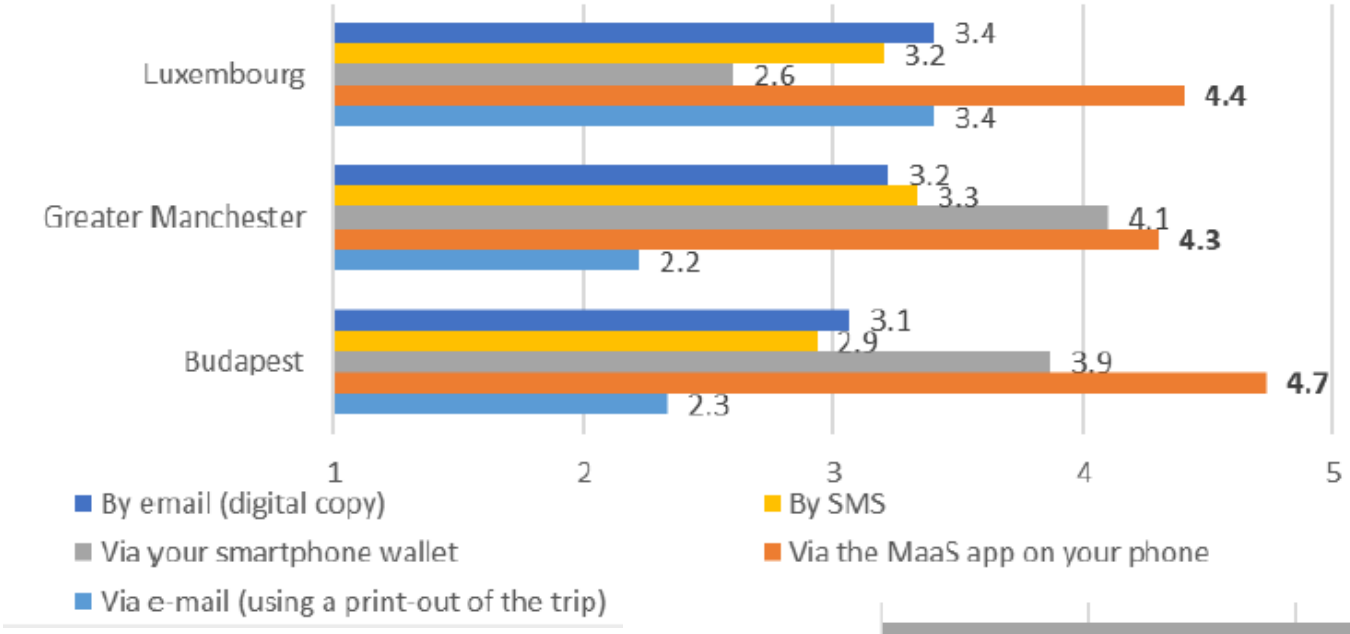


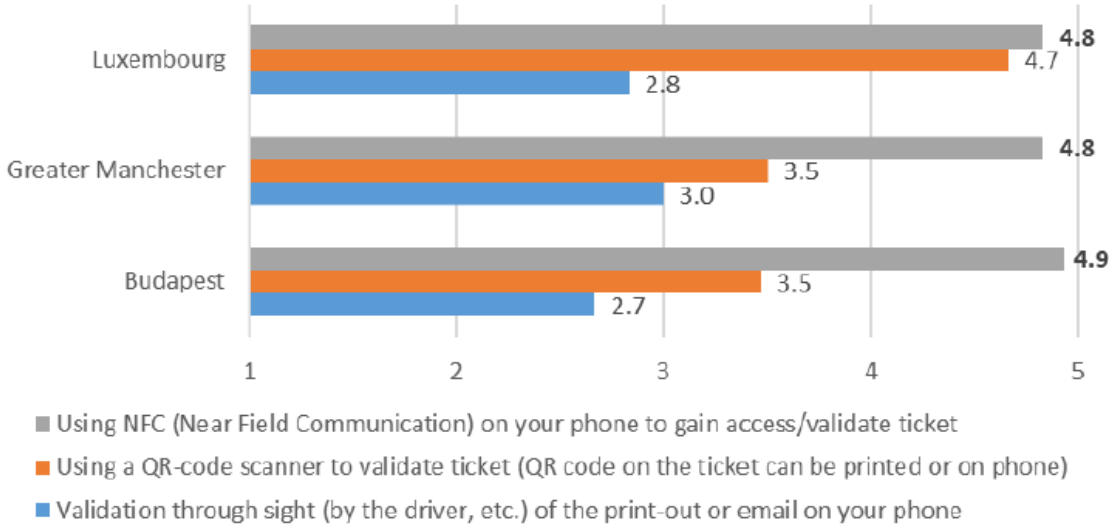
(c) Luxembourg

Important actors



Ticketing


Luxembourg
3.4
3.2
2.6
4.4
3.4
Greater Manchester
3.2
3.3
4.1
4.3
2.2
Budapest
3.1
2.9
3.9
4.7
2.3
1
2
3
4
5
By email (digital copy)
By SMS
Via your smartphone wallet
Via the MaaS app on your phone
Via e-mail (using a print-out of the trip)


Luxembourg
4.8
4.7
2.8
Greater Manchester
4.8
3.5
3.0
Budapest
4.9
3.5
2.7
1
2
3
4
5
Using NFC (Near Field Communication) on your phone to gain access/validate ticket
Using a QR-code scanner to validate ticket (QR code on the ticket can be printed or on phone)
Validation through sight (by the driver, etc.) of the print-out or email on your phone

SWOT analysis

- Strengths:
  - better user experience,
  - integrated service,
  - changing of way of thinking,
  - easy accessibility,
  - new business approach
- Opportunities:
  - flexible services,
  - cheaper transportation,
  - long-term decrease of vehicle ownership,
  - better services of public transport,
  - competition
- Weaknesses:
  - payment issues between operators,
  - different levels of services,
  - need of travel behaviour change,
  - less cooperation
- Threats:
  - data protection,
  - investment cost,
  - organizational issues,
  - not unique business development,
  - rapidly changing technology

Platform requirements

- optimize existing public transport options
- increase citizen travel satisfaction
- minimize overall travel time
- provide push notifications in case of delays or service changes
- provide personalized recommendations
- learn from the user habits
- share satisfaction data with service providers
- share information about trip with public authorities
- ensure secure payment transactions
- offer monthly packages
- possible services calculated by the fare calculation engine
- ticket provided through an application

GDPR issues

- General Data Protection Regulation (GDPR):
  - legal framework for data protection
  - laws adopted in 2016, effective in 2018
- Communication infrastructure:
  - data exchange with service provider,
  - Issue: matching GPS coordinates with its location, the system can track users, allowing to follow movements and detect patterns
- Data providers:
  - data are provided by different sources
  - Issue: quality of information, division of responsibility
- Transportation operators:
  - provision of complex services
  - Issue: information security
- MaaS operators:
  - owner of the technological platform
  - creates unique offers comparing different providers
  - Issue: systematic monitoring of a publicly accessible area on a large scale

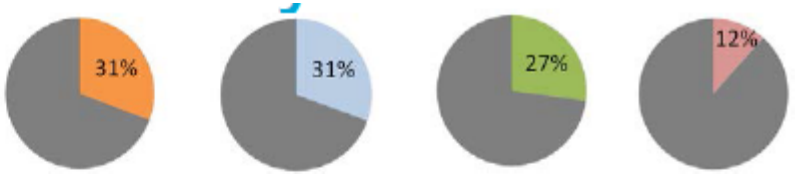
MaaS user groups

- survey with more than 1000 valid responses
- 12 indicators to evaluate

- Socio-demographic data: age, gender, education, household composition, employment, income
- Mobility patterns: frequency of use of different transportation modes
- Mobility related data: driving license, car availability, PT availability, usage of new modes
- General innovativeness: attitude, smartphone usage, mobile internet usage, usage of journey planning applications

MaaS user groups

- Latent class analysis
- 1 important – 4 not important

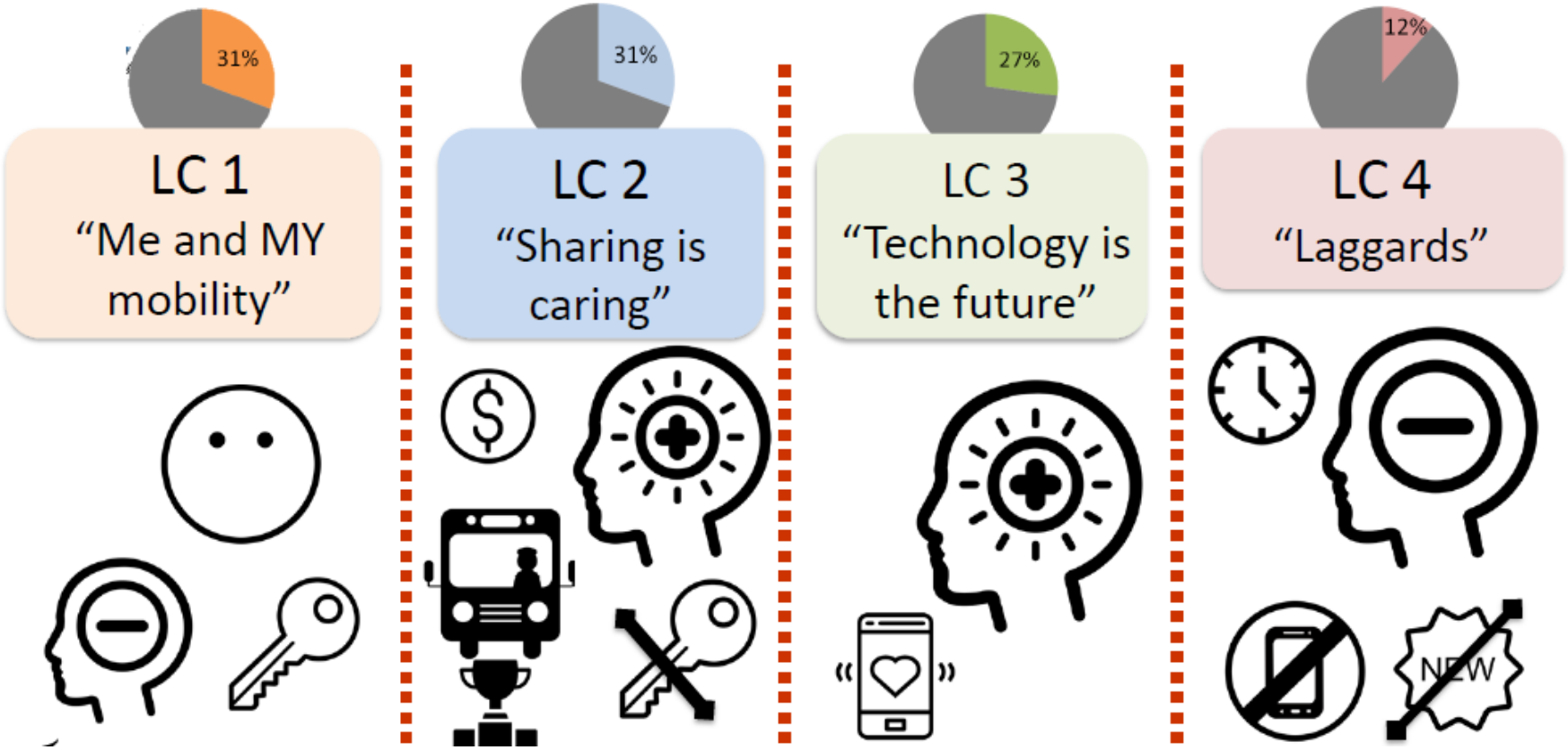


			LC 1	LC 2	LC 3	LC 4
Mobility as a Service (MaaS)	Paying for information	Payment for accurate information	1	3	2	4
		Payment for reduced time uncertainty	2	3	1	4
	MaaS app	Multimodal app	3	2	1	4
		App usage skills	3	2	1	4
		Payment through app	3	2	1	4
	Intermod.	Combination of modes	3	2	1	4
	Multimodality / no-ownership	Exclusive usage of owned modes	4	1	2	3
		Variability in travel patterns	4	1	2	3
		Consideration of different modes	3	1	2	4
		Willingness to experiment in mobility	3	1	2	4
		Privacy	4	1	2	3
		Mode agnosticism	3	1	2	4

13

MaaS user groups

- Typical features of the groups



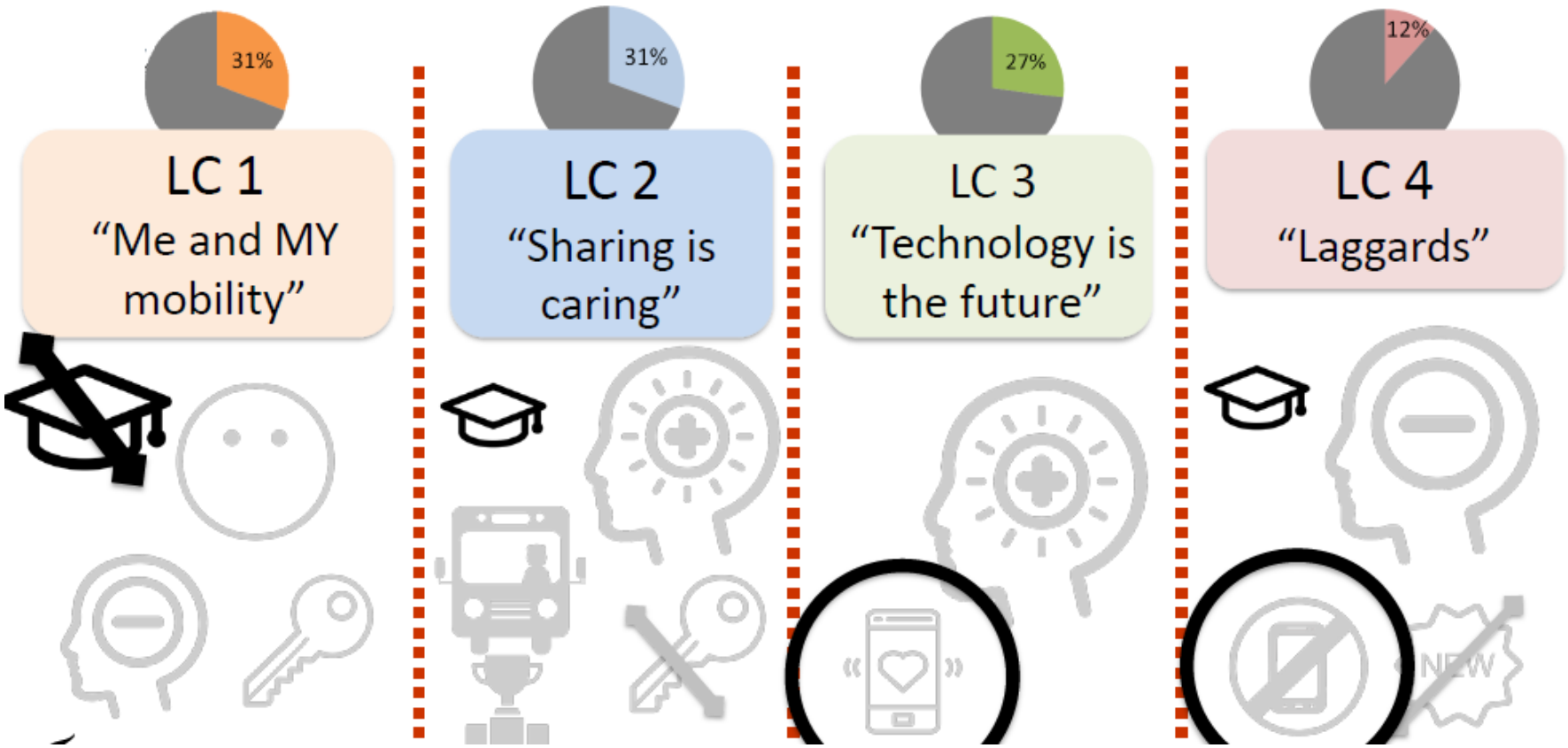
MaaS user groups

- Most relevant features:

- Socio-demographic data: age, gender, **education,** household composition, employment, income
- Mobility patterns: frequency of use of different transportation modes
- Mobility related data: driving license, car availability, PT availability, usage of new modes
- General innovativeness: **attitude,** smartphone usage, mobile internet usage, **usage of journey planning applications**

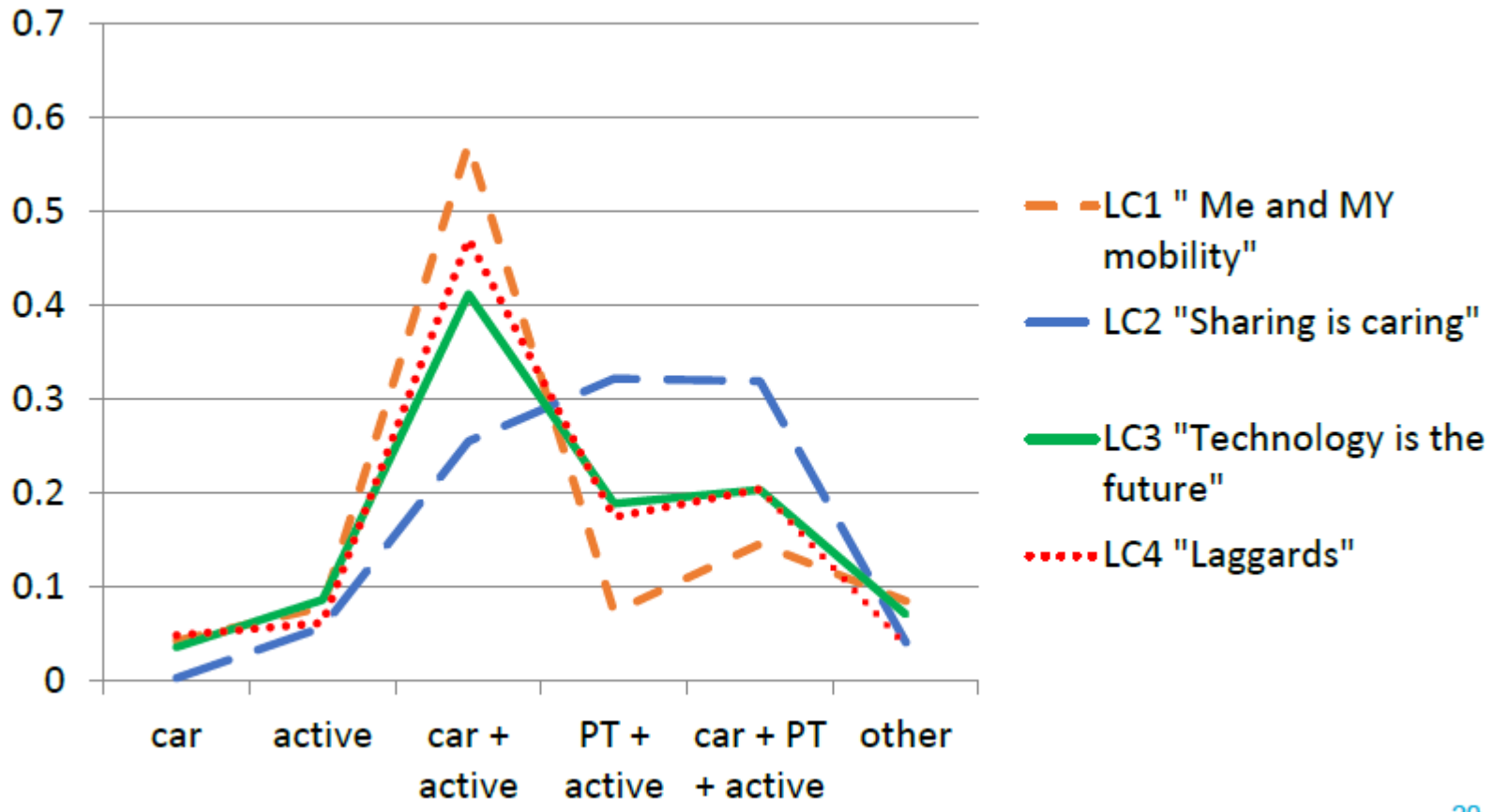
MaaS user groups

- Mainly different features of the groups



MaaS user groups

- Difference in mobility patterns

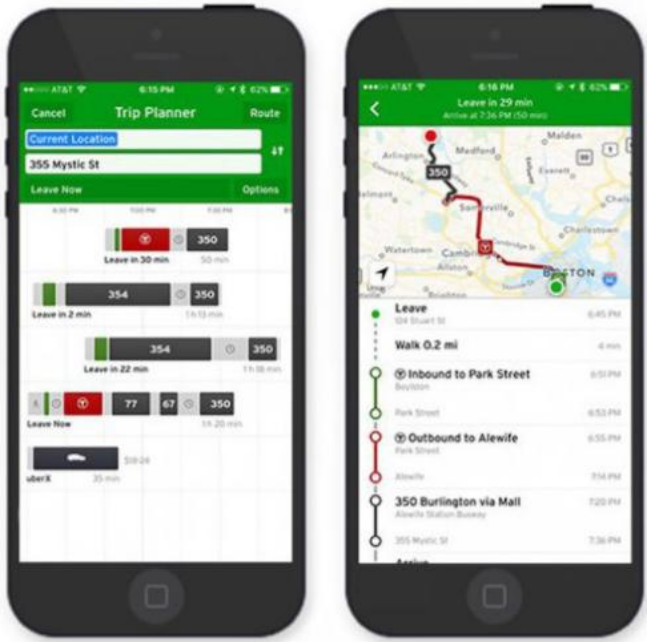


MaaS applications

MaaS applications

TransitApp

- Launch year: 2012
- Status: operational
- Area: USA, UK, Canada, Europe, Australia
- Modes: PT, bike sharing, car sharing, taxi
- Tariff option: pay per use
- MaaS operator: private company
- Features
  - Trip planning
  - Real time information
  - Booking (car sharing, taxi)
  - Service alerts
  - Link with calendar and contacts

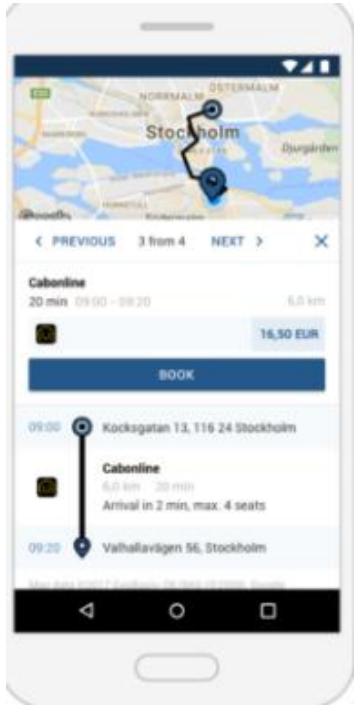


Optymod'Lyon

- Launch year: 2012
- Status: operational
- Area: Lyon, France
- Modes: PT, bike sharing, regional train, parking
- Tariff option: no payment
- MaaS operator: local authority
- Features
  - Trip planning
  - Real time information
  - Booking (bike sharing)
  - Service alerts
  - Airplane schedules

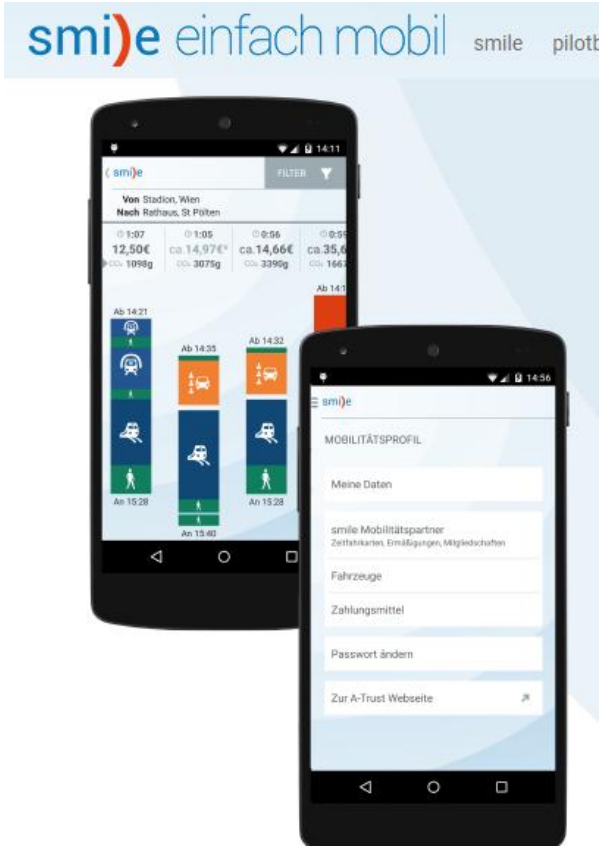
UbiGo

- Launch year: 2013
- Status: operational (large scale project planned)
- Area: Gothenburg, Sweden
- Modes: PT, bike sharing, car sharing, taxi, car rental
- Tariff option: monthly
- MaaS operator: private company
- Features
  - Trip planning
  - Booking
  - Ticketing
  - Payment
  - 24 hour support



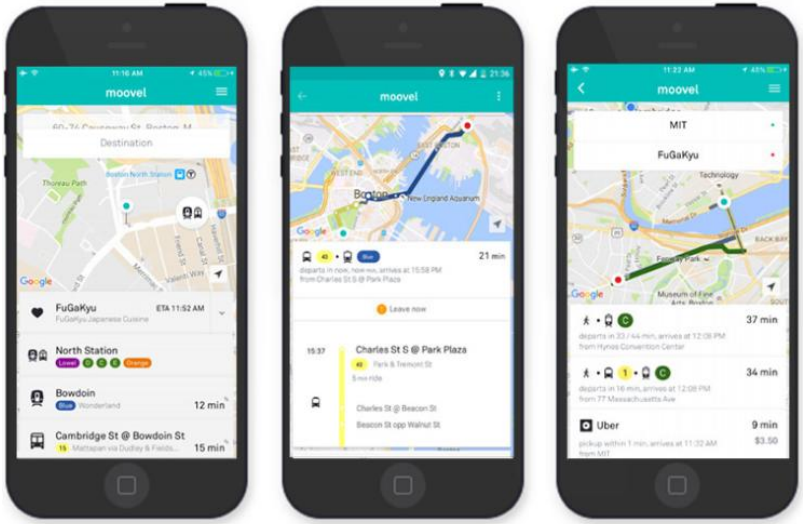
Smile

- Launch year: 2014
- Status: stopped
- Area: Vienna, Austria
- Modes: PT, bike sharing, car sharing, taxi, train, ferry, parking, charging stations
- Tariff option: pay per use
- MaaS operator: private company
- Features
  - Trip planning
  - Real time information
  - Booking (car sharing, taxi, train)
  - Ticketing and Payment
  - Mode filtering based on cost, time and CO2 emission



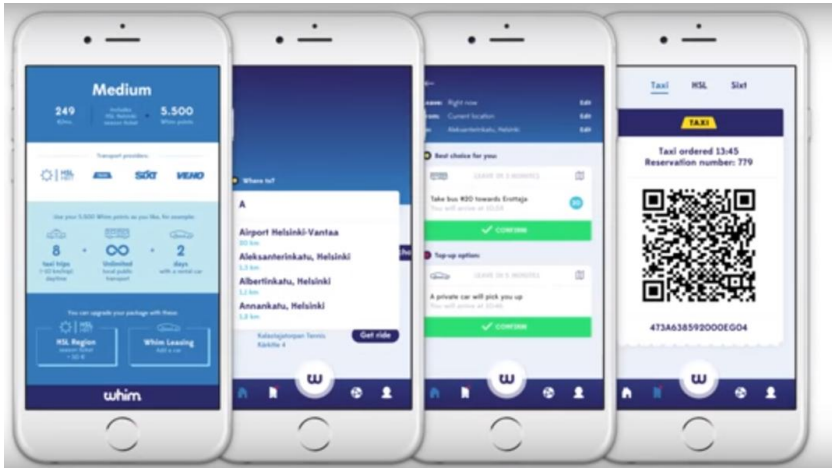
Moovel

- Launch year: 2016
- Status: operational
- Area: Germany
- Modes: PT, bike sharing, car sharing, taxi, train, ferry
- Tariff option: pay per use
- MaaS operator: private company
- Features
  - Trip planning
  - Real time informaiton
  - Booking
  - Ticketing and Payment
  - Favourit routes
  - Notification of disruptions
  - Link to social media account



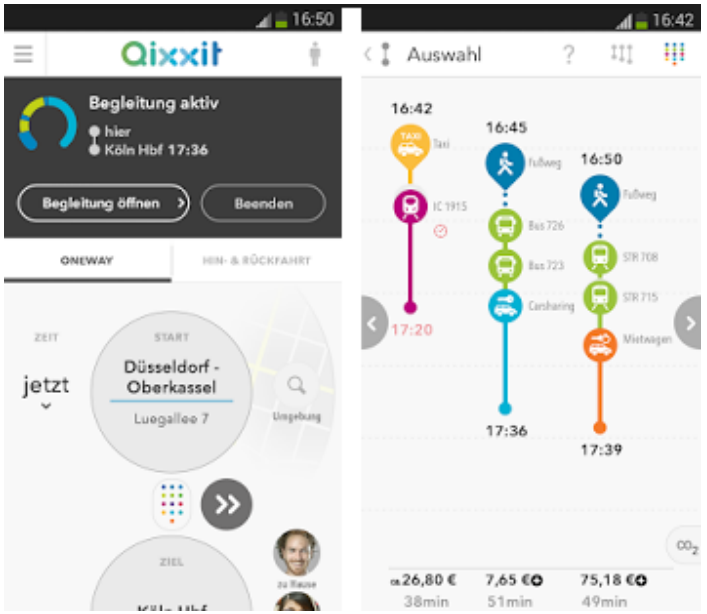
Whim

- Launch year: 2016
- Status: operational
- Area: Helsinki, Finland
- Modes: PT, bike sharing, car sharing, taxi, car rental, train
- Tariff option: pay per use and monthly
- MaaS operator: private company
- Features
  - Trip planning
  - Real time information
  - Booking
  - Ticketing and Payment
  - Calendar synchronization
  - Social interactions

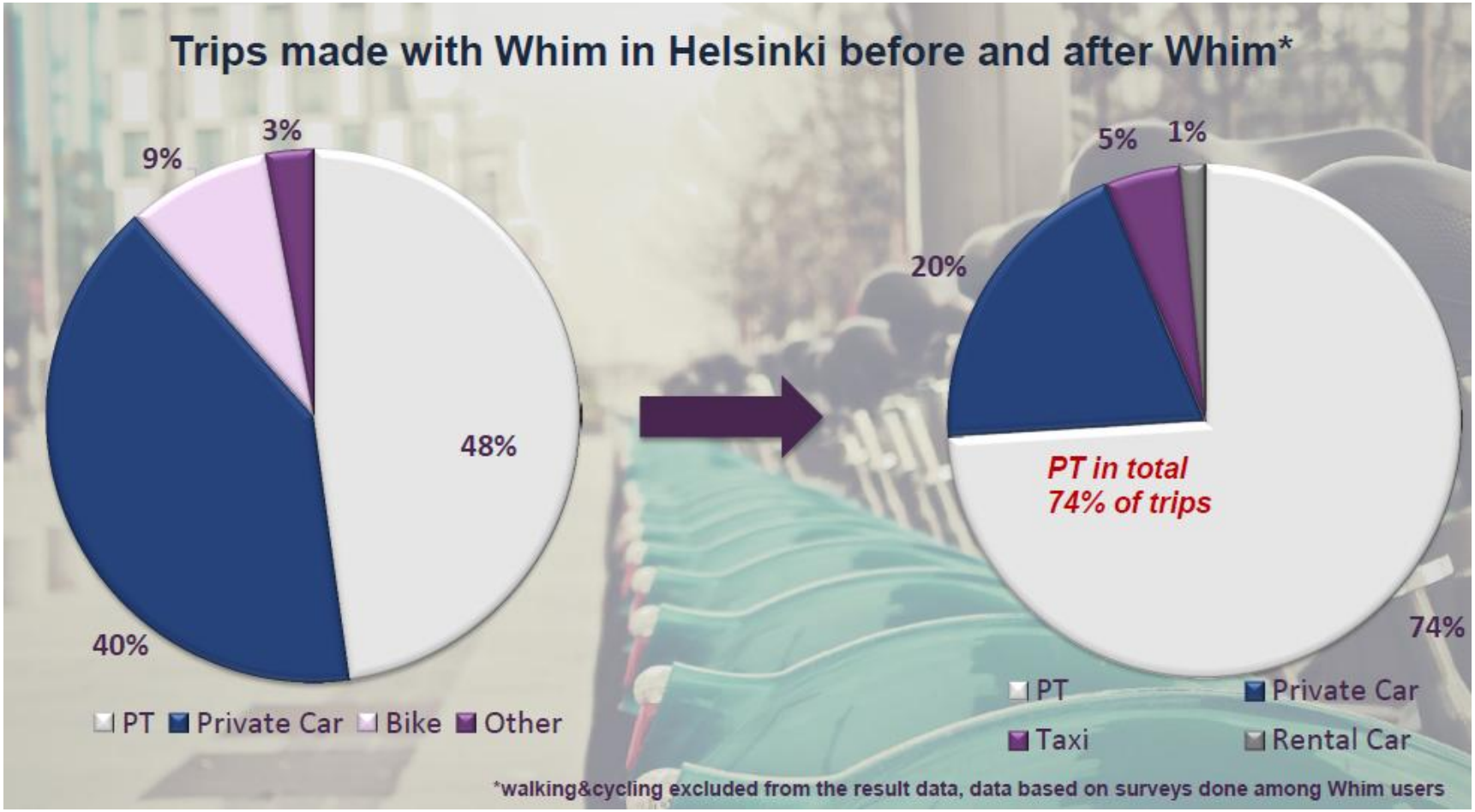


Qixxit

- Launch year: 2014
- Status: operational
- Area: Germany
- Modes: PT, bike sharing, car sharing, taxi, car rental, train, coach, flights
- Tariff option: pay per use
- MaaS operator: public company
- Features
  - Trip planning
  - Real time information
  - Booking
  - Ticketing and Payment
  - Service alerts
  - Favourites



Result of MaaS



Future of MaaS