

Mobility as a Service: Different Directions and Perspectives

Soora Rasouli

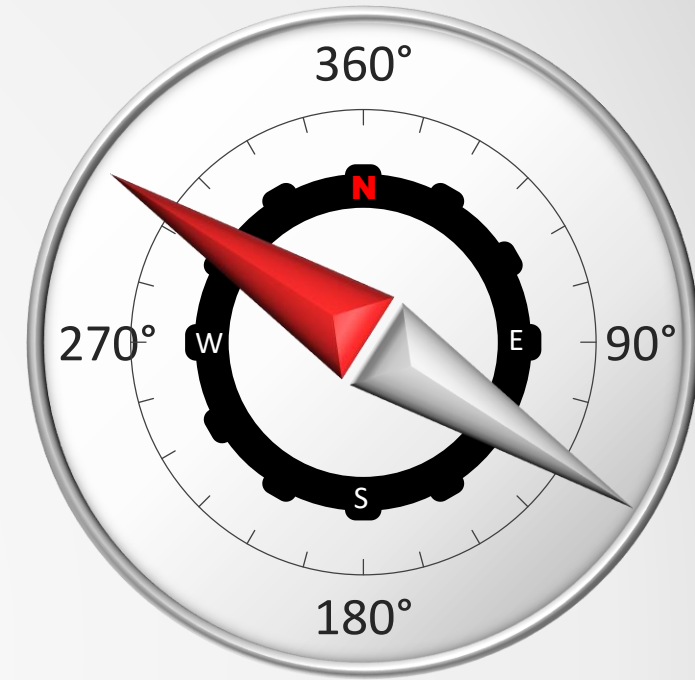
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MaaS – Definition

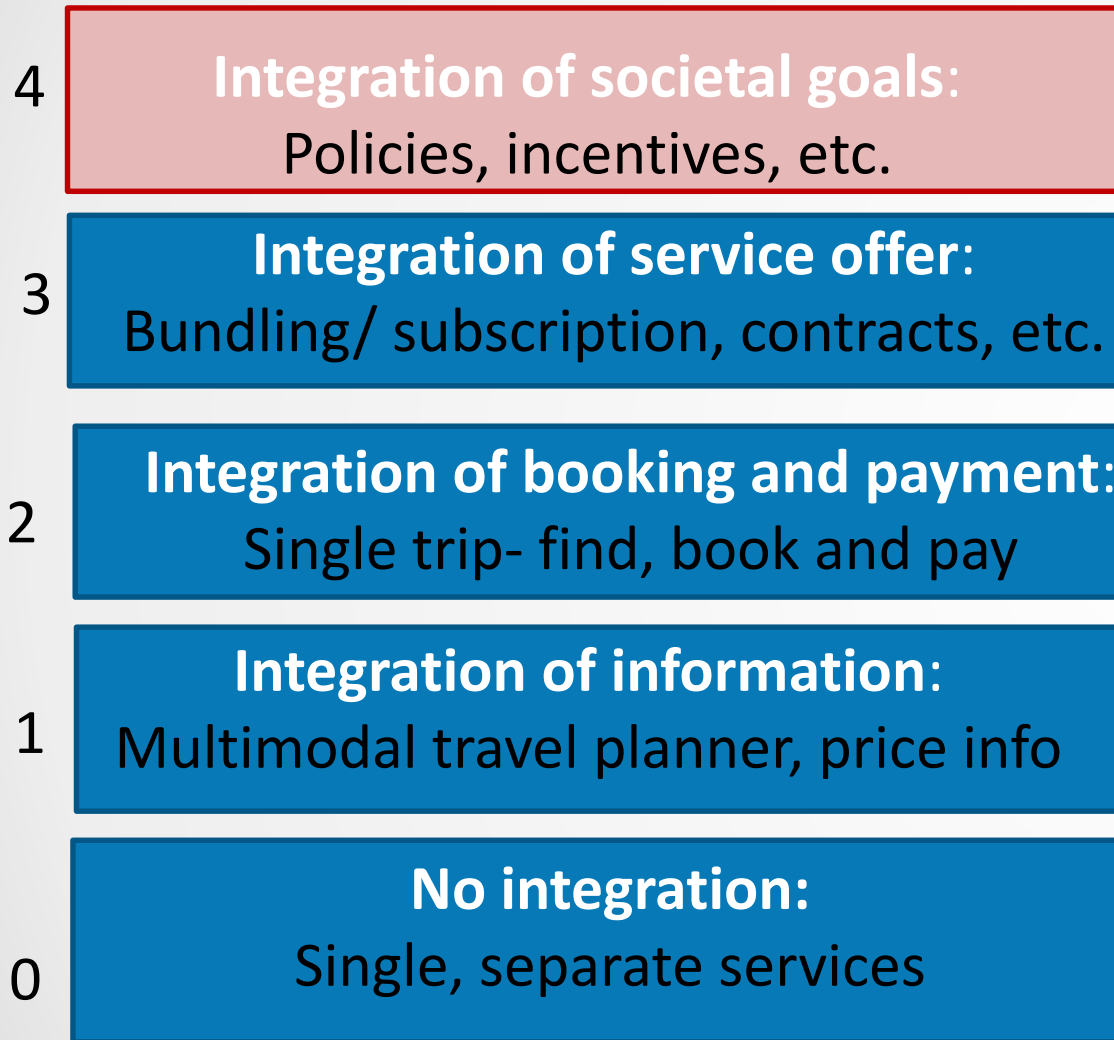
Mobility as a service is an **technology- enabled mobility management** concept

Mobility as a service is a **subscription** to a **bundle** of various transport modes which are offered to users on an **integrated platform**.

The mobility management concept goes back to 1991 by US department of transportation. Inability of technology halted the jump to the mainstream delivery.



MaaS – Topology



Sochor et al (2017)

UbiGo
whim

HANNOVERmobil
smi)e einfach mobil

moovit
Qixxit Google
Einfach. Unterwegs.

TRANSPORT
FOR LONDON

Hertz

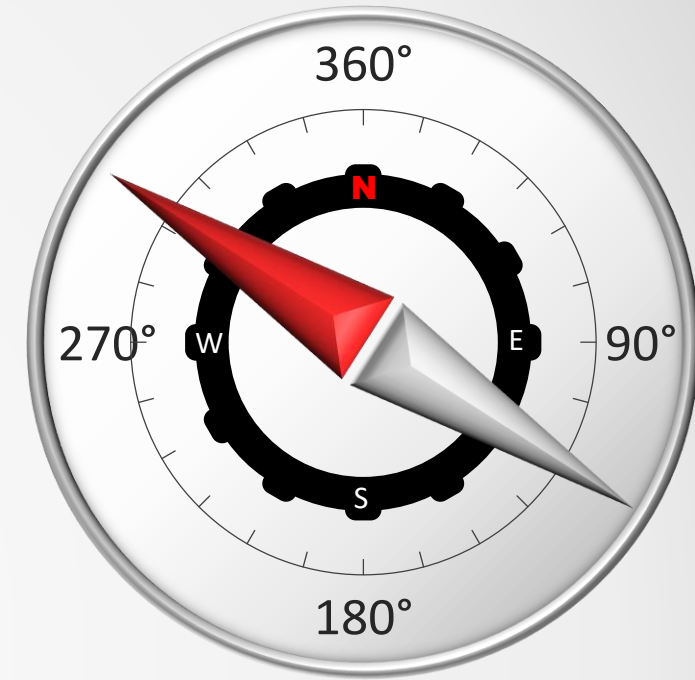
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MaaS – Promises

The promises include :

- *increasing convenience and flexibility*
- *improving accessibility*
- *a step toward more sustainable transport*



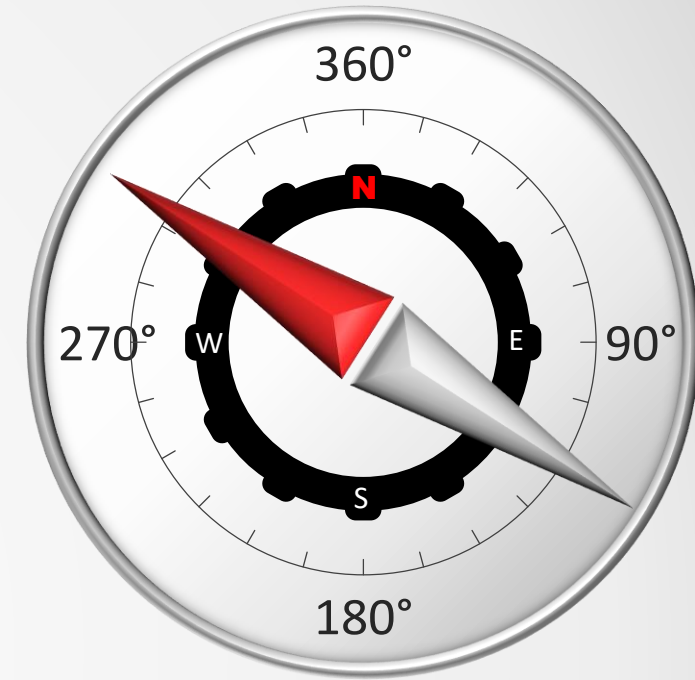
MaaS – Promises

The promises include :

- *increasing convenience and flexibility*

if all transport providers agree to have one single

ticketing and payment method and share their data



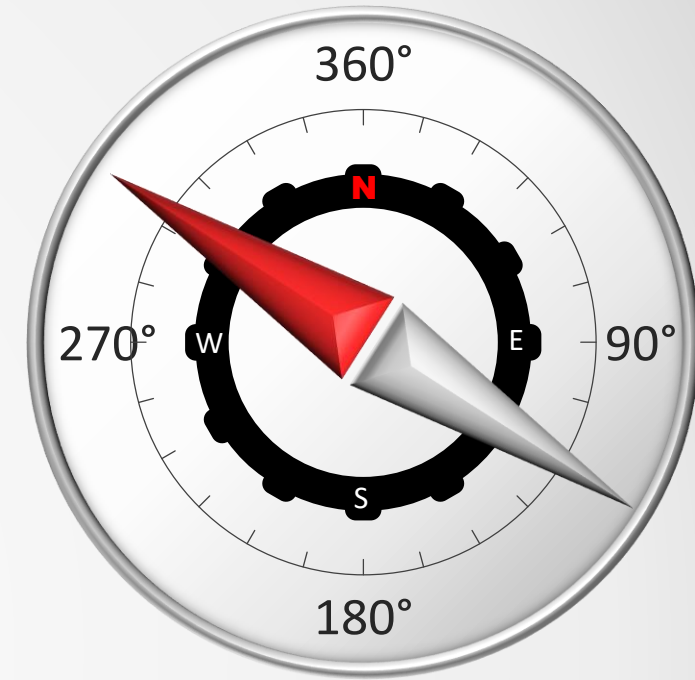
MaaS – Promises/ challenges

Convincing successful global service providers Uber, ecab, etc to join MaaS.

Convincing private providers to share their data

MaaS platform should have simple open API (Application programming Interface) to let other providers easily join MaaS.

In many countries public transport tickets are heavily regulated. Third parties are not allowed to sell tickets, marginal revenue for platform operators .



MaaS – Promises

The promises include :

- *improving accessibility*

if options include first and last mile, acceptable walking distance to available car/ bike sharing stations. Deserves attention in rural areas.

To tackle low demand in rural areas a special business model may be needed



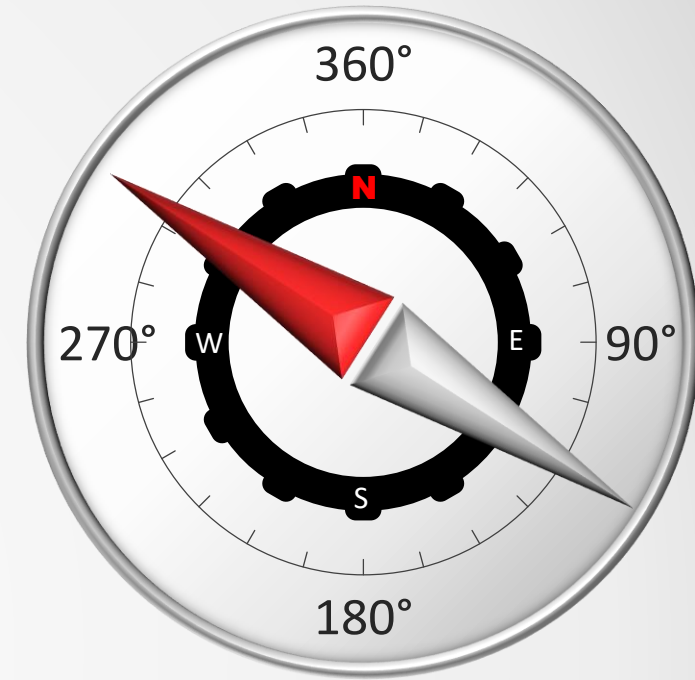
MaaS – Promises

The promises include :

- *a step toward more sustainable transport*

What would be the overall shifting process; from private car toward shared mobility, from public transport toward on demand transport such as car sharing or taxi!

In reality it needs proper business models, involvement of city authorities, government



MaaS – Application

A pre evaluation of the area/ city is recommended before composing an action plan.

Legislation

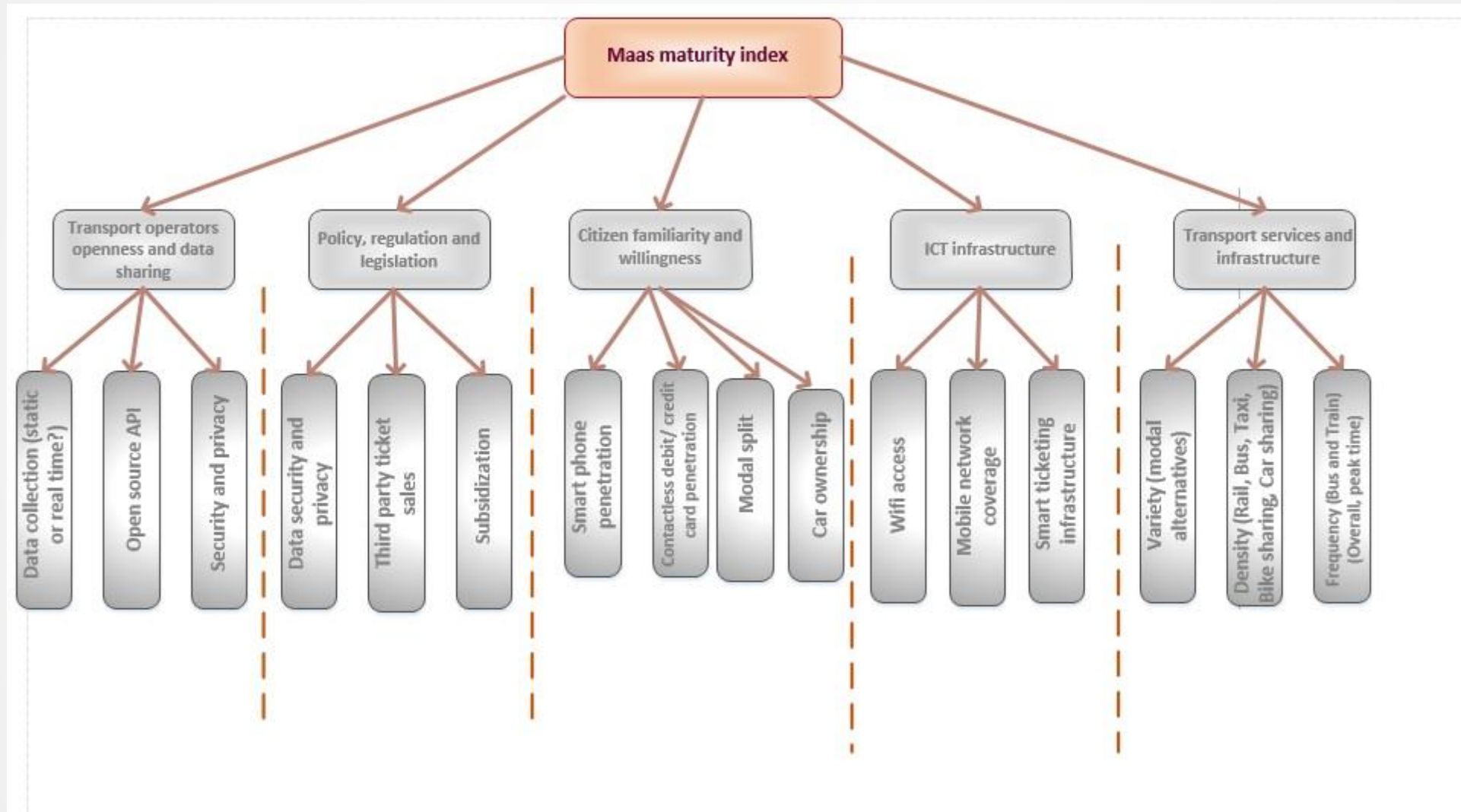
(ICT) Infrastructures

Citizens' willingness

-
-
-



Maas maturity index



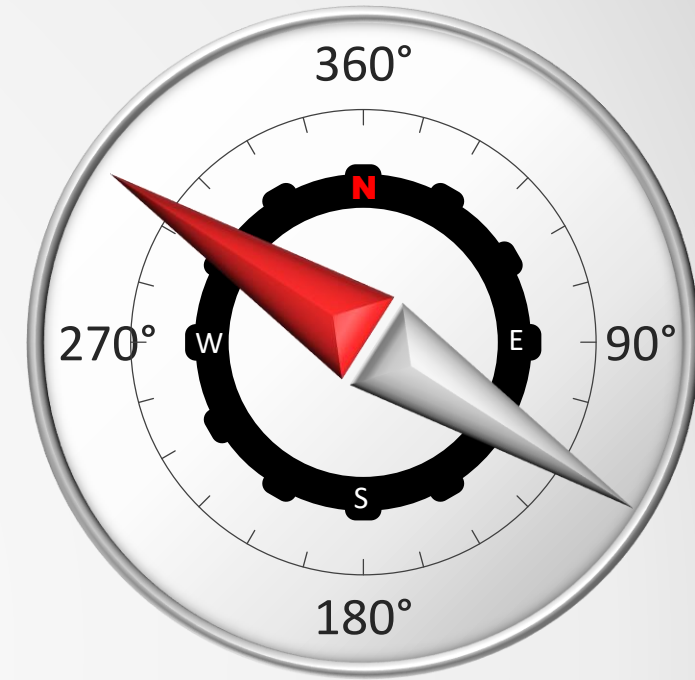
MaaS – Prospects

- *Extension to rural areas where accessibility problem is more serious*
- *More focus on demand responsive collective services (Uberpool, etc)*
- *Systematically study the substitution effect with special focus on “postponing the purchase of the first car” or “skipping the purchase of the second car”*



MaaS – Prospects

- *Inclusion of MaaS (subscription decision, extra mode, information acquisition) in Activity based models*
- *Improvement in optimization of vehicle fleet and routing algorithm for demand responsive (collective) transport options*

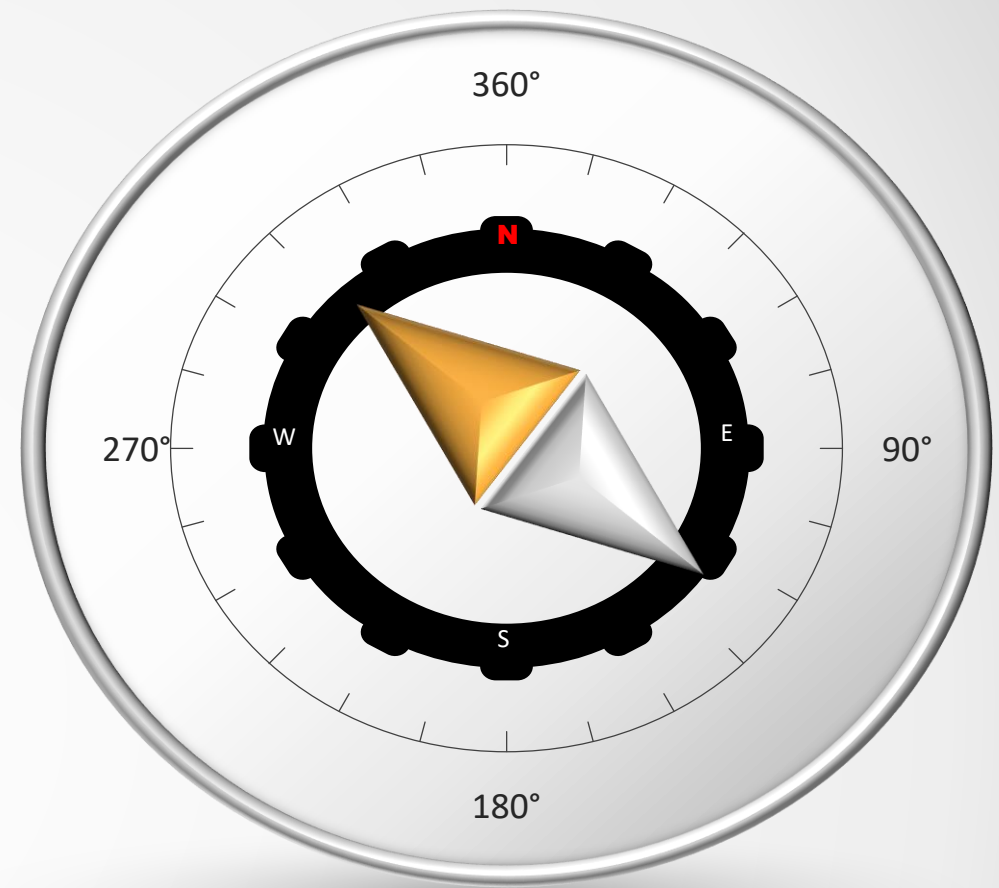


- Two critical questions:

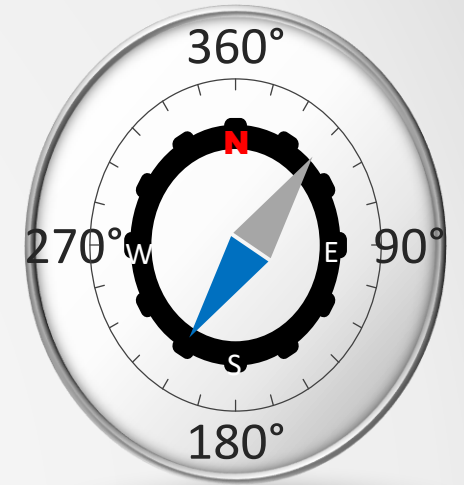
1) what would be the demand for such mobility option as a function of characteristics of the MaaS (bundle options), price but also social influence and attitudinal characteristics



2) How do people use the different options within their subscription once they subscribe?



MaaS – Empirical study 1



MaaS **subscription decision**, considering service attributes and social influence



Bundling and pricing scheme choice



Choice and willingness to pay for **extra features** of the service



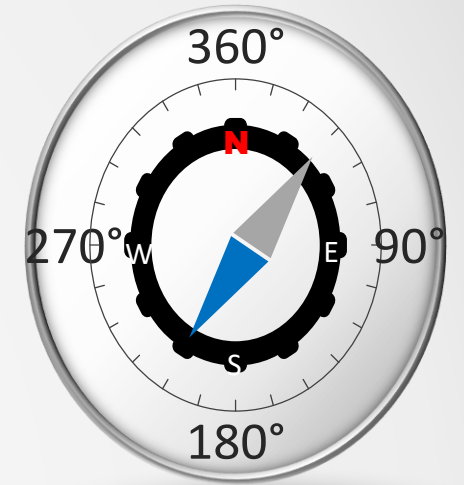
MaaS – Empirical study 1

Mimic real
world decision
processes

Maintain
experimental
control



**Sequential Portfolio
Choice Experiment**



- Choice about **subscribe or not** to the service
- Choice about **pricing schemes** and **transport modes composition** of bundles
- Choice for adding sets of **extra features** to the basic service at an additional price

1st step

MaaS – Empirical study 1



Platform

- Price of monthly subscription
(4 levels)
- Data required for the registration
(4 levels)
- Time commitment
(4 levels)



Transport modes

Pricing schemes (4 levels) for each of the following choice alternatives:

- Public Transport
- E-bike sharing
- Car-sharing
- Taxi
- Car rental
- Ride-sharing
- On demand bus



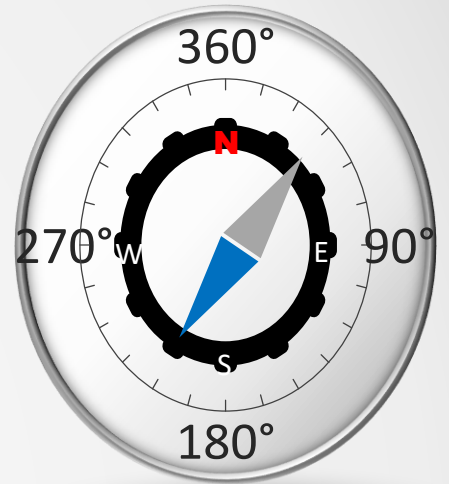
Social influence

- General reviews of the service
(4 levels)
- Market share among:
 - Relatives
(4 levels)
 - Friends
(4 levels)
 - Colleagues
(4 levels)

14 variables with 4 levels → 4^{14} FF

→ 128 possible choice sets from **orthogonal fractional factorial design** blocked in 16 orthogonal subsets

MaaS – Empirical study 1



Voorbeeld keuze set

Veronderstel dat u het volgende abonnement voor een Mobility as a Service dienst krijgen aangeboden. Zou u dat abonnement nemen? Welke vervoerwijzen zou u dan in het abonnement opnemen? U kunt maximaal 4 vervoerwijzen kiezen.

Vervoerwijzen			Prijs:	200 €/maand
• Openbaar vervoer (inclusief bus, metro, tram): <small>Standaardtarief: 0,89 € instaptarief + 0,15 €/km</small>	Betaal per rit	<input checked="" type="checkbox"/>	Duur van het abonnement:	3 maanden
• Delen van een elektrische fiets: <small>Standaardtarief: 2 €/uur</small>	Ongelimeerd aantal reizen	<input checked="" type="checkbox"/>	Gegevens die nodig zijn voor registratie:	Volledige naam, email adres, telefoon nummer
• Delen van een elektrische auto: <small>Standaardtarief: 0,31 €/min</small>	Inclusief 120 min; daarna betaal per rit	<input type="checkbox"/>	Algemeen ontvangen service recenties:	Hoofdzakelijk negatief maar soms positief
• Taxi: <small>Gemiddeld standaardtarief: 3 € instap tarief + 2 €/km</small>	Inclusief 30 km; daarna betaal per rit	<input checked="" type="checkbox"/>	Het volgende percentage mensen uit uw sociaal netwerk is ook lid van MaaS:	
• Autohuur: <small>Gemiddeld standaardtarief: 49 € per dag, inclusief onbeperkt aantal km</small>	Betaal per rit met 20% korting op het basistarief	<input type="checkbox"/>	Familieleden	25%
• Delen van ritten: <small>Standaardtarief: 0,05 €/km</small>	Betaal per rit	<input checked="" type="checkbox"/>	Vrienden	75%
• Busje op verzoek: <small>Standaardtarief: 3,5 €/rit</small>	Onbeperkt aantal ritten	<input type="checkbox"/>	Collega's	50%

Uw keuze:

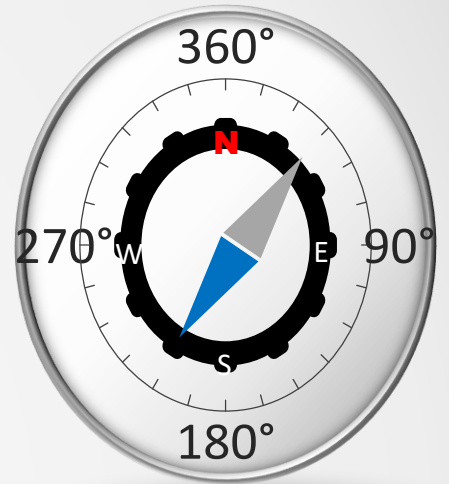
Ja, ik zou een abonnement nemen



Neen, ik zou geen abonnement nemen



MaaS – Empirical study 1



Voorbeeld keuze set

In aanmerking nemende dat de dienst tegen de tarieven alleen een basis functionaliteit heeft (reisplanning, reservering, kaartje kopen, betalen en rekening sturen), welke aanvullende opties zijn u dan willen kopen tegen de genoemde extra prijzen?

Prijs van het basisabonnement: 150 €/maand

	Optie 1	Optie 2	Geen van beide
Ontvang real time alarmen en aankondigingen van gebeurtenissen zoals vertragingen, onderbrekingen en een aanbeveling voor een alternatieve route	✓	X	
App synchronisatie met uw agenda	X	✓	
Betalen voor parkeren	X	✓	
Vastleggen van uw reis zodat de CO2 en emissies van de rit bepaald kunnen worden	✓	X	
Met uw abonnement kunt u de dienst gebruiken	In heel Nederland	In heel uw regio	
Gratis niet-verlengbare proefperiode van	1 week	1 maand	
U kunt gratis uw abonnement opzeggen: anders is de boete:	2 dagen voordat het afloopt 25% van de abonnementsprijs	2de helft van uw abonnementsperiode 50% van de abonnementsprijs	
Er is geen boete als u canceled:	¹ een geplande rit 1 uur voor de aanvangstijd ² bij rit met onmiddellijke ingang 4 minuten voor de aanvangstijd van de reservering anders moet u 75% van de prijs voor de rit betalen	een geplande rit 3 uur voor de aanvangstijd: bij rit met onmiddellijke ingang 2 minuten voor de aanvangstijd van de reservering anders moet u 25% van de prijs voor de rit betalen	
De extra kosten voor het total van deze opties is:	9 €/maand	7,5 €/maand	
Uw keuze:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

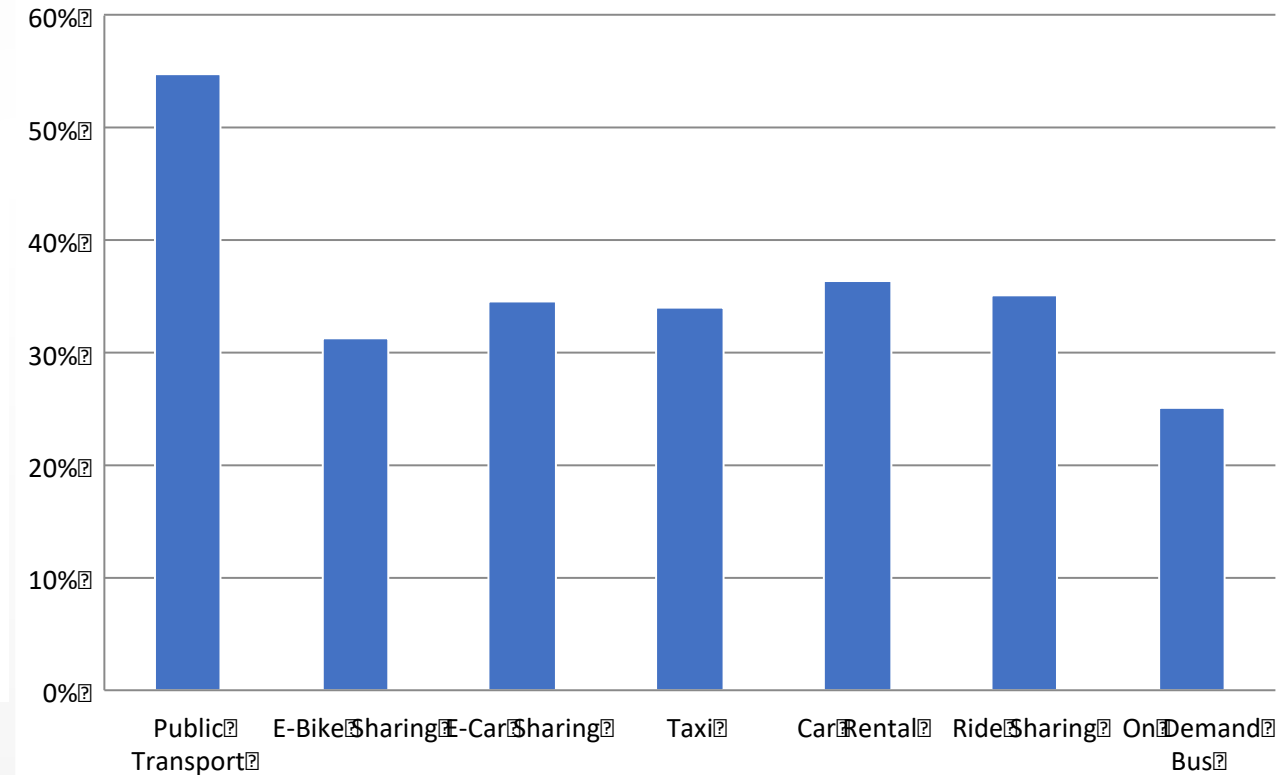
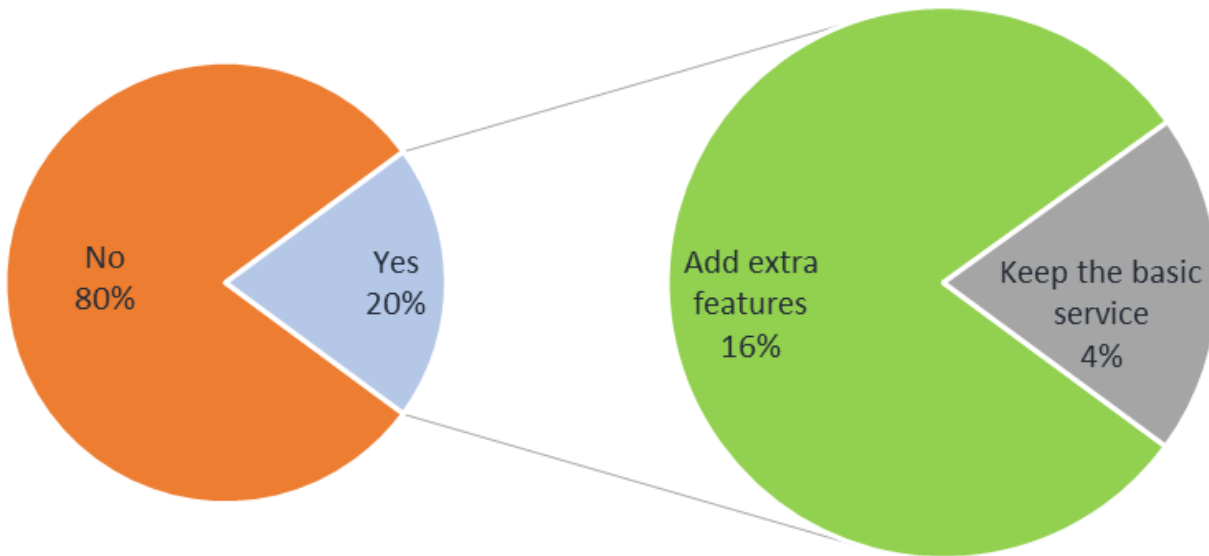
MaaS – Empirical study 1

☐ **Completed questionnaires: 687 in August 2017, and 755 in March 2018.**

Step1
Decision to subscribe

Step2
Decision to add extra features

Step1
% of frequencies of transport mode choice in bundle composition observed among all the respondents that decided to subscribe



MaaS – Empirical study 1

2-stage process of subscription decision



Traditional choice experiment

with a **Binomial** Choice (1 from a set of 2)

Binary Mixed Logit Model

Utility of the subscription is a function of:

- constant
- transport modes pricing schemes
- subscription price
- social influence attributes
- socio-demographics and travel related characteristics
- error term



Portfolio choice experiment

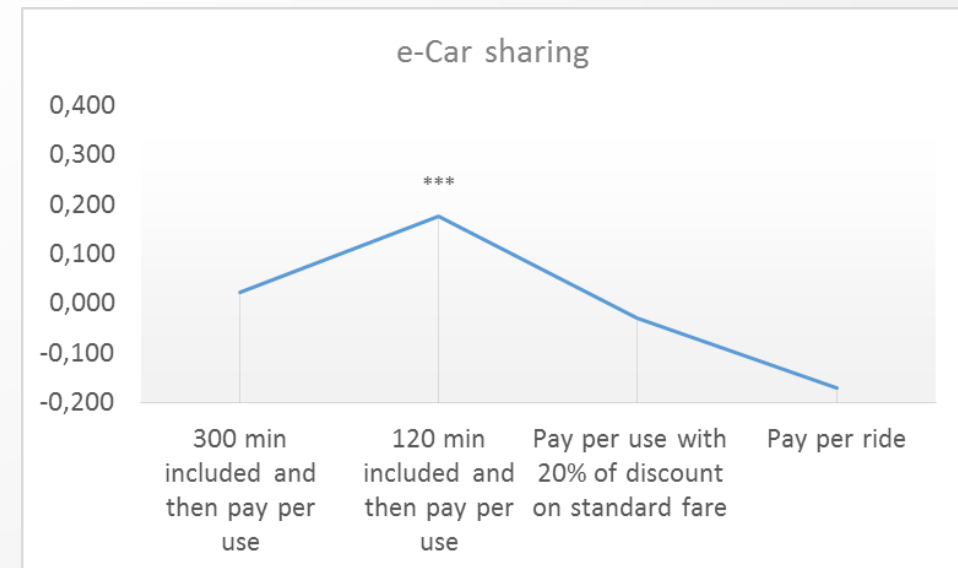
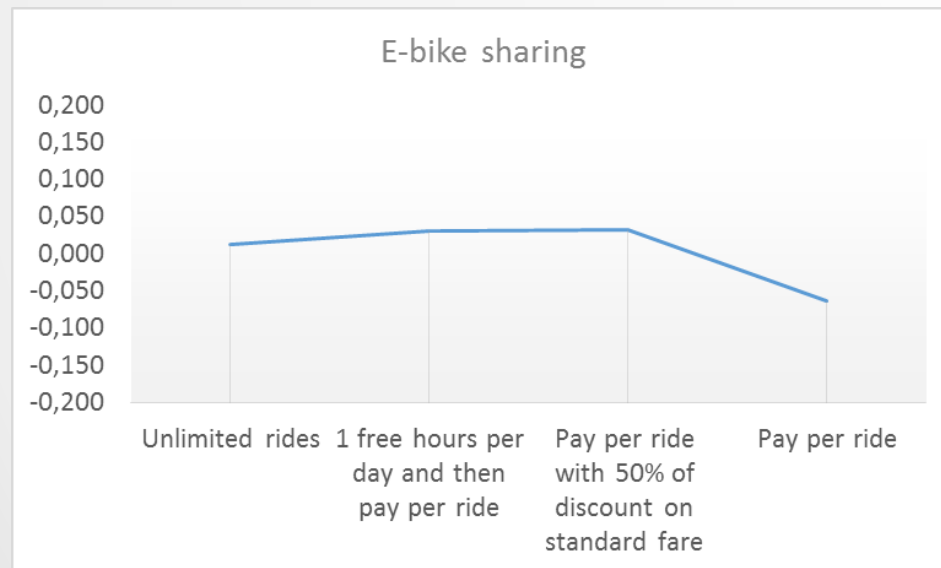
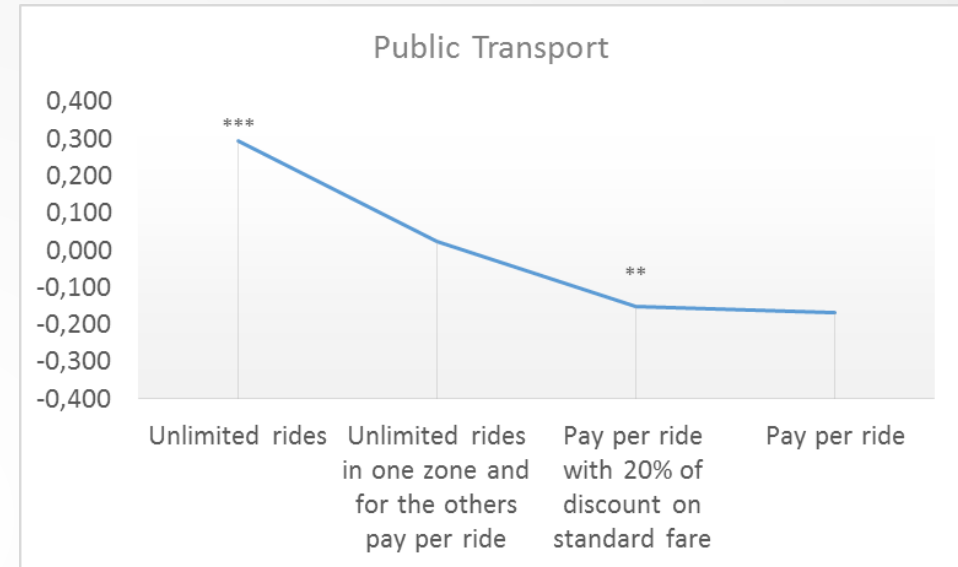
with a **Multivariate Binary** Choice (1 or up to 4 from a set of 7)

Mixed Logit Model

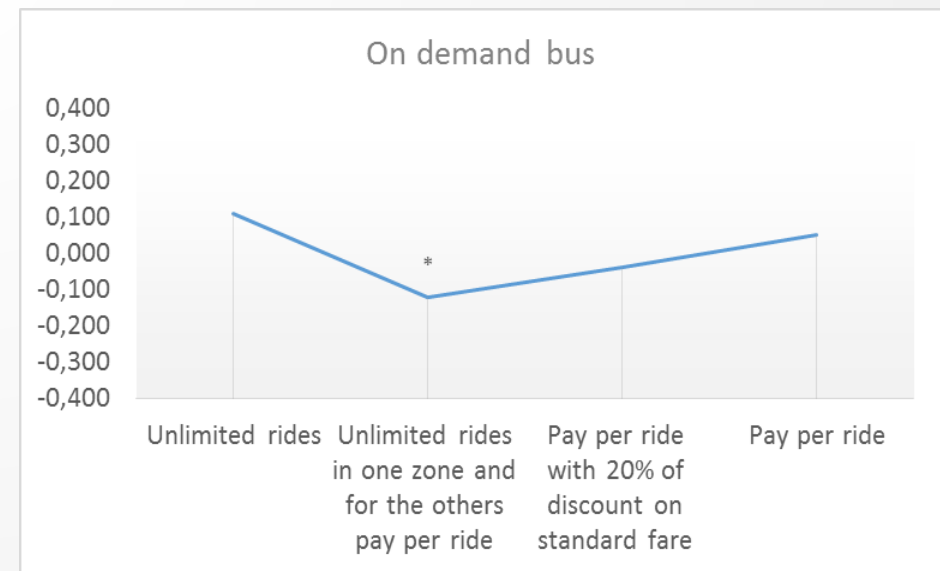
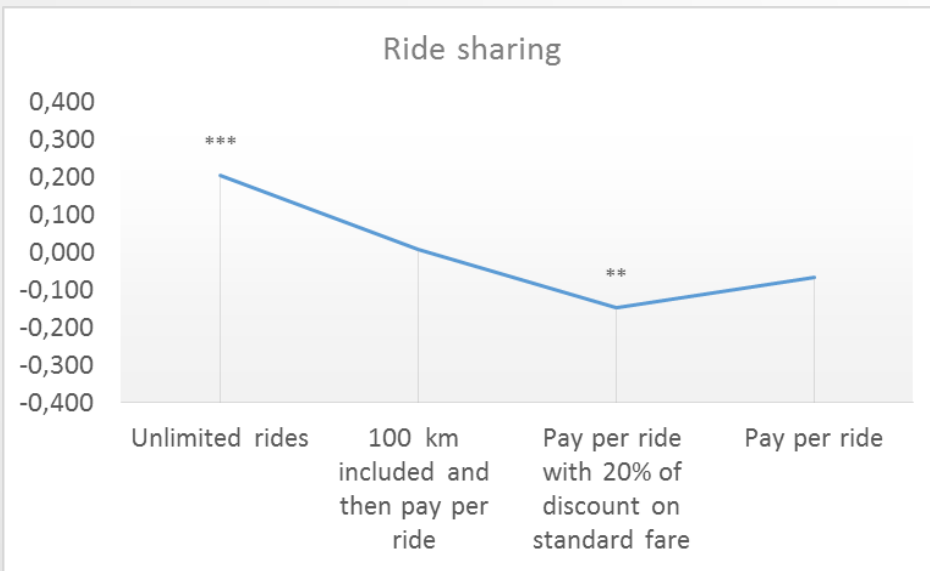
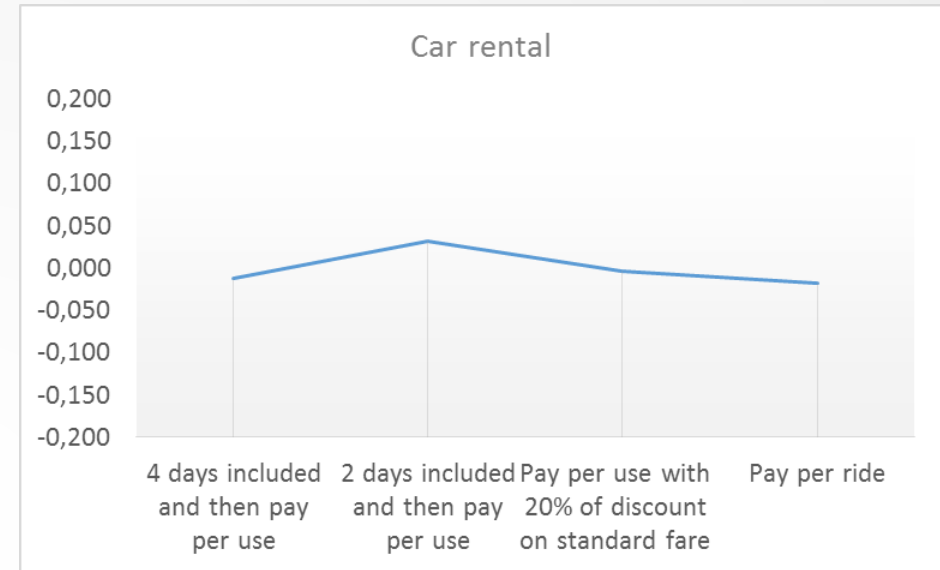
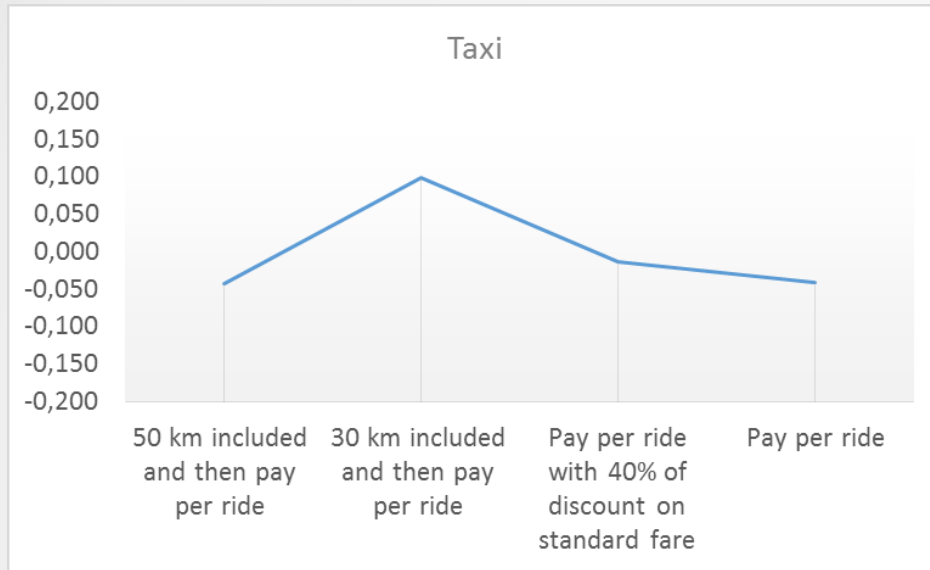
Utility of the bundle is a function of:

- transport modes pricing schemes
- transport modes main effects
- pair-wise interactions between transport modes
- Interaction effects with socio-demographics and travel-related characteristics
- error term

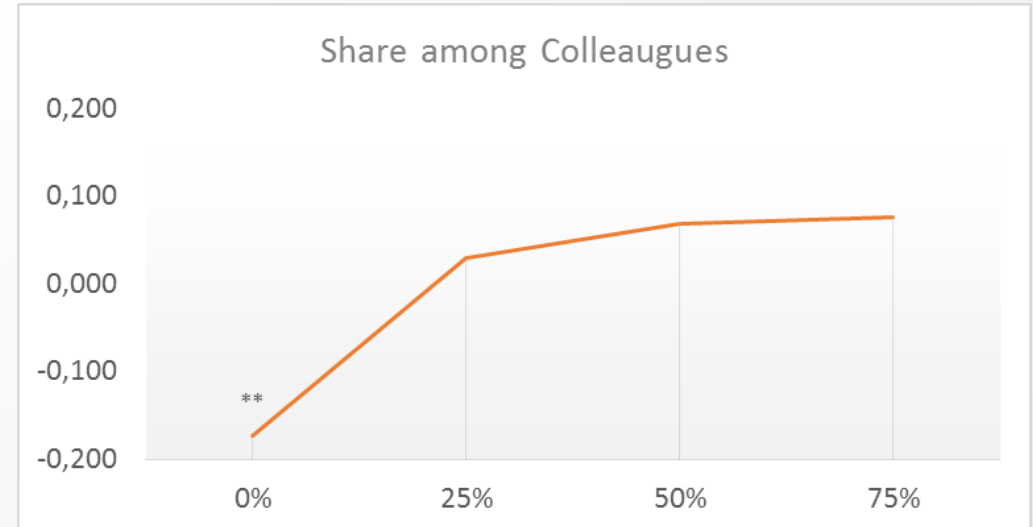
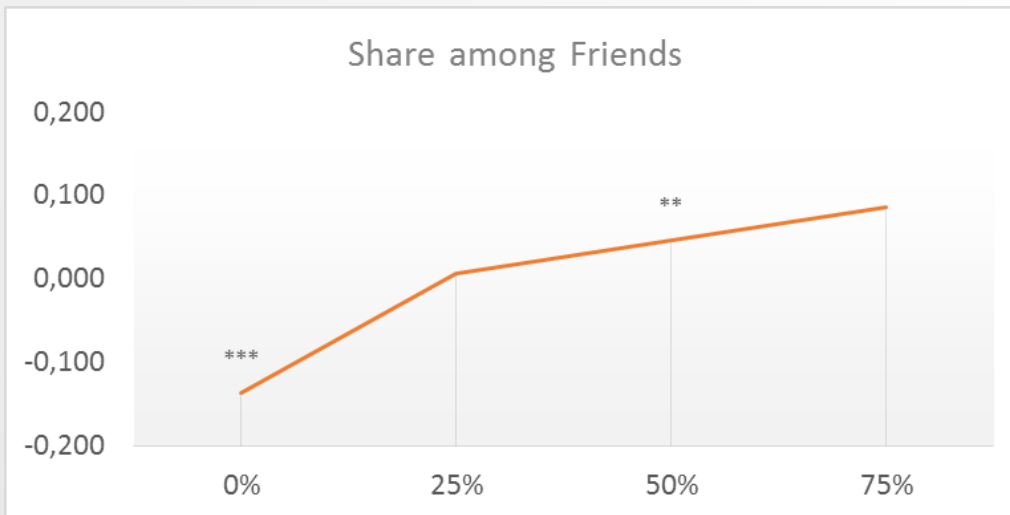
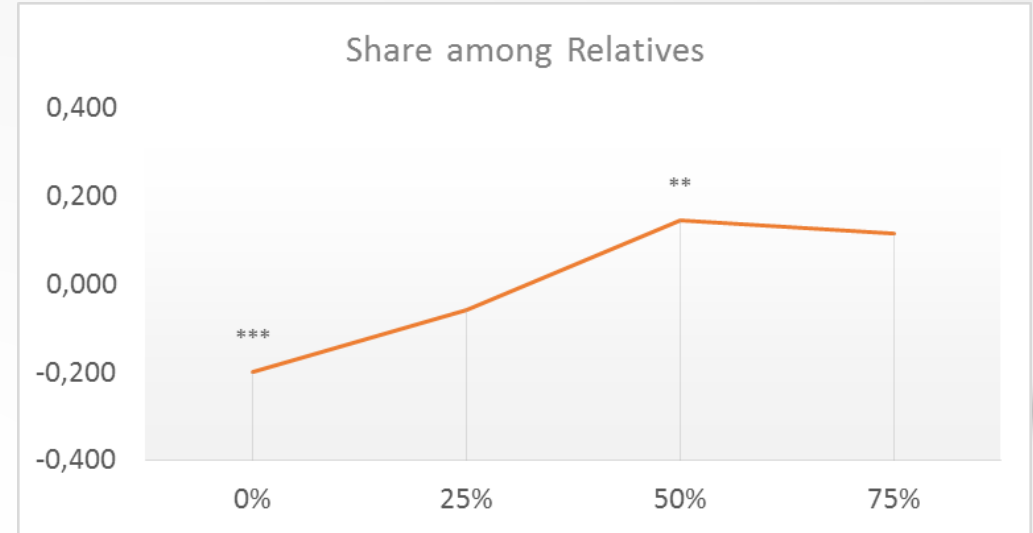
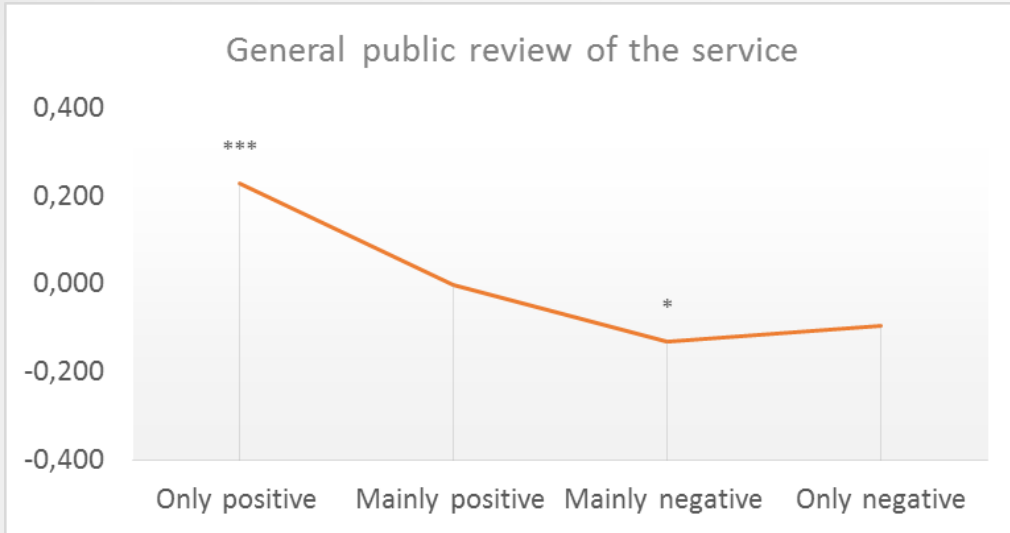
MaaS – Empirical study 1



MaaS – Empirical study 1



MaaS – Empirical study 1



MaaS – Empirical study 1

- Social demographic effects:

Male and younger age group higher tendency to subscribe

Single households with child show the highest positive effect and single without child least interested group

The middle level income are more interested compared to the lowest and highest level income

Households with more than one car have the lowest interest to subscribe, followed by the household without car. Households with one car are the ones with highest interest.

MaaS – Empirical study 1

Additional analysis:

- Technology acceptance (Adapted from *UTAUT2, Venkatesh et al. 2012*)
 - Using MaaS app would help me to organize and execute my trips more efficiently
 - I think the use of MaaS app would be clear and understandable
- Innovation adoption (Adapted from *Diffusion of Innovation Theory, Rogers 1962*)
 - If I will become a MaaS users, it will be noticed by people close to me
 - By using MaaS, I think that I will encourage my relatives and friends to use it for their trips
- Trust in a web-based service (Adapted from *McKnight et al., 2001*)
 - I think that the service offered with MaaS would be reliable
 - I think using MaaS app for payment would be safe

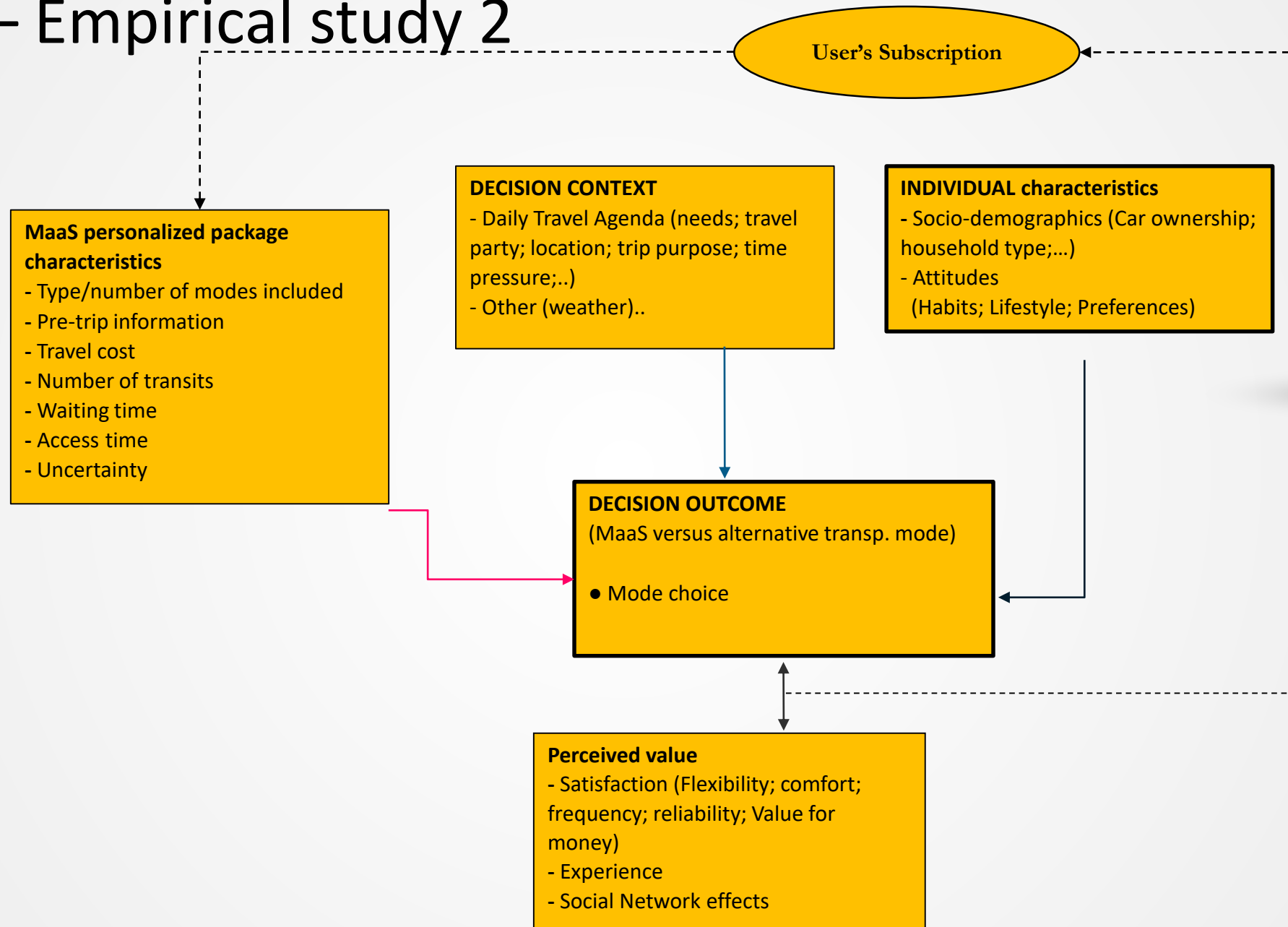
MaaS – Empirical study 1

Additional analysis:

- Privacy concerns (Adapted from *Smith et al. 1996*)
 - I usually get annoyed when mobile apps ask for personal information
 - I'm concerned that mobile apps collect too much personal information about me.

- Tariff choice biases (Adapted from *Lambrecht and Skiera 2006*)
 - If I pay a flat rate, I feel much more free and more relaxed about travelling than when I have to pay a price per km
 - Traveling is less pleasant if I have to think that the costs increase every minute or kilometer

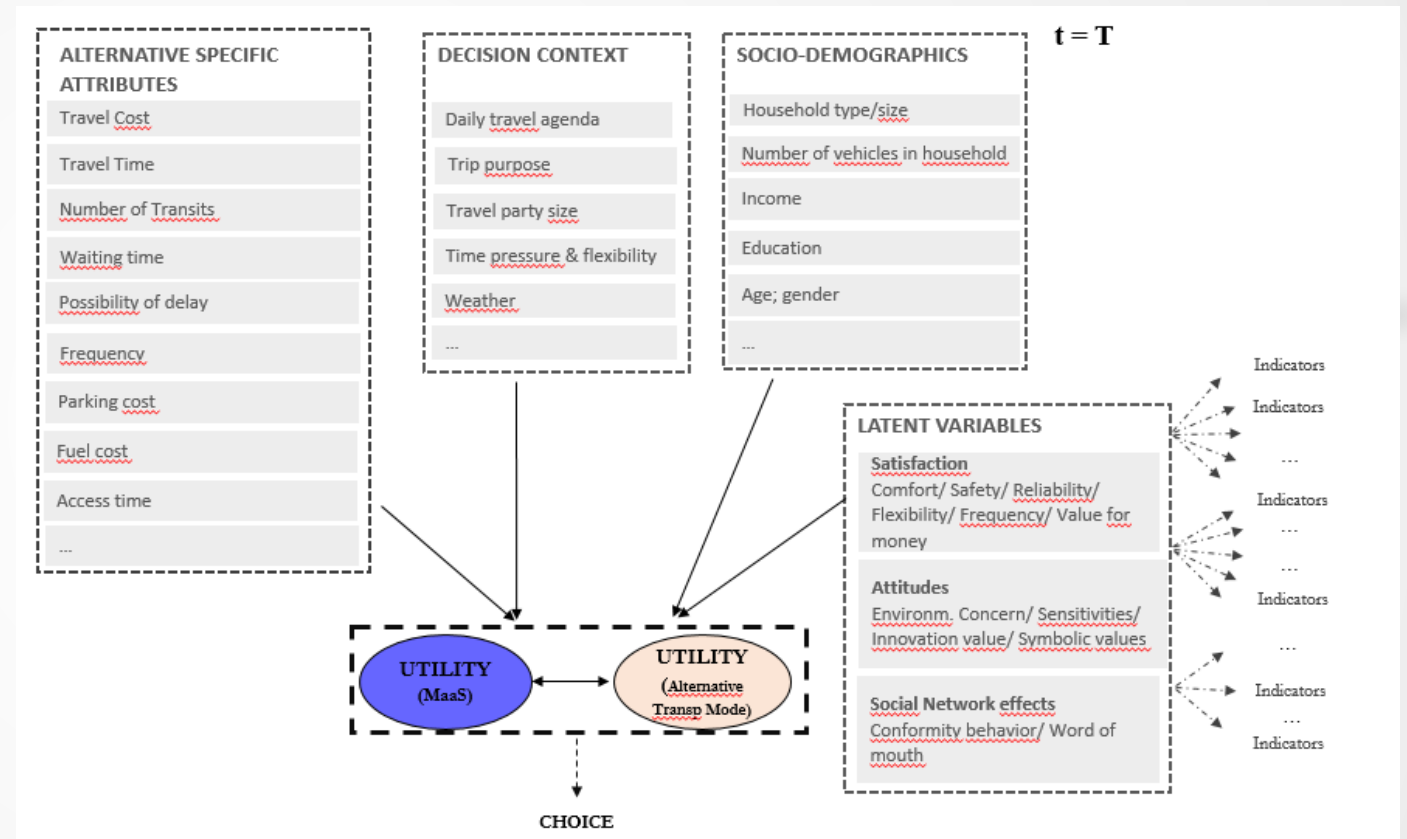
MaaS – Empirical study 2



MaaS – Empirical study 2

Hybrid Choice Modeling

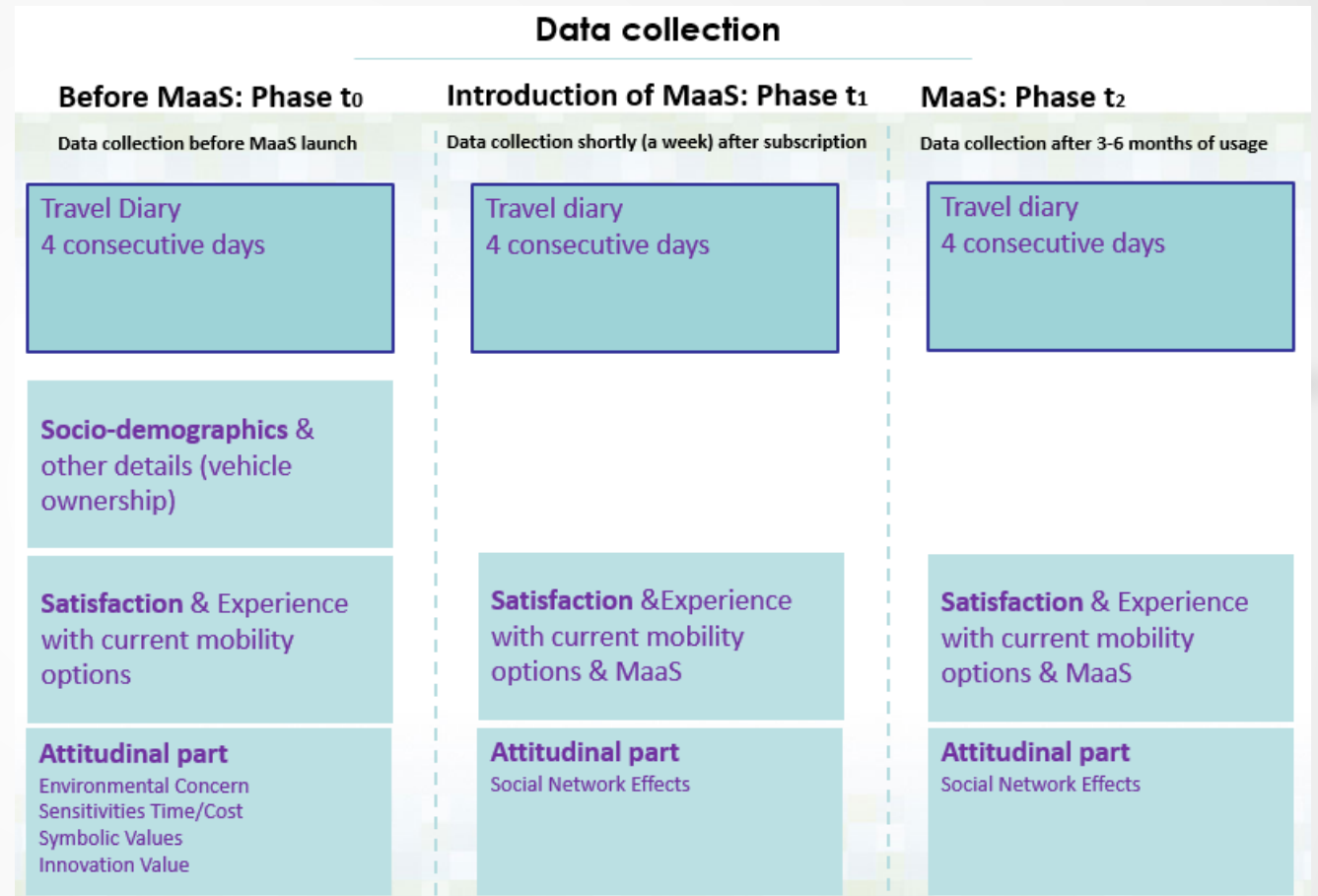
- ✓ Integrated modeling framework
- ✓ Combines both observable and latent factors
- ✓ Unobserved heterogeneity
- ✓ Time effects



MaaS – Empirical study 2

Longitudinal data

- ✓ Same sample of households/individuals
- ✓ Data collection before, during and after MaaS pilot introduction
- ✓ Measuring within sample travel behavior change over time



THANK YOU

