Expert meeting on:
"ADDRESSING THE UNFORESEEN IMPACT OF STRUCTURAL CHANGES ON EUROPEAN AIR QUALITY"

Warsaw, 11th and 12th February 2019

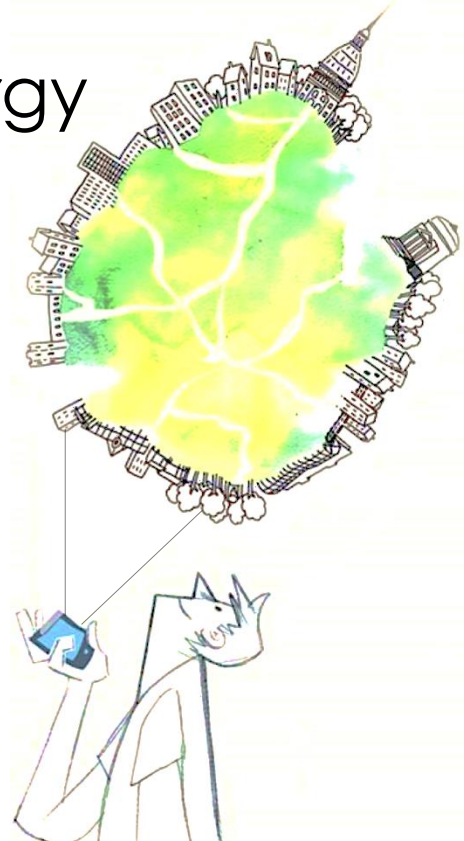
Addressing behavioural changes in energy and transport

Changes in mobility demand

Cristina Pronello
Professor, Chaire MIDT
(Mobilité Intelligentes et Dynamiques Territoriales)

Sorbonne Universités – UTC

Politecnico di Torino



Presentation layout

- Sustainable Mobility challenges: which solutions ?

- The role of travel behaviour

- The stakeholders responsibility

How will mobility change in the next future ?

BEN is exhausted. It's 9 o'clock on Friday evening, he's been at his desk for 13 hours, and he's clocked

Deloitte. Insights | Industries | Topics | Economics | Multimedia | Deloitte Review | Regions | Search | Join | Log in

Article

September 14, 2016

The future of mobility: What's next?

Tomorrow's mobility ecosystem—and how to succeed in it

ASK SCOUT Search assistant BETA

A journey like Ben's, and the complex web of actors required to make it happen, may be possible sooner than many of us imagine.

https://www2.deloitte.com/insights/us/en/focus/future-of-mobility/roadmap-for-future-of-urban-mobility.html

How will mobility change in the next future ?

- Different forms of mobility:
  - Electric mobility
  - Connected and Automated Vehicles
  - Shared mobility + Electric-Connected-Automated

  + new business models
- Technology (ATIS)

- Role of transport policies

What impacts on air pollution ?

Shared mobility: some facts and figures

- PwC (2015) states that:
  - **8%** of all adults have participated in some form of automotive sharing;
  - **1%** have served as providers under this new model, chauffeuring passengers around or loaning out their car by the hour, day or week;
  - **one-third of consumers** say that the automotive industry produces too much waste;
  - millennials drive less and are less likely to get drivers licenses;
  - millennials consider cars as an opportunity, no emotional value, no status symbol;
  - smartphones make driving "expensive":
    - a passenger can read email in transit and be "productive"
    - Uber states that the same applies for drinking: "since the launch of UberX in California, drunk-driving crashes decreased by 60 per month for drivers under the age of 30".
  - **59%** of respondents said they will not trust sharing economy businesses until they are properly **regulated**.
  - Consumers like automotive sharing economy models:
    - 56% better pricing
    - 32% more choice in the marketplace
    - 28% more convenient access

How market has changed

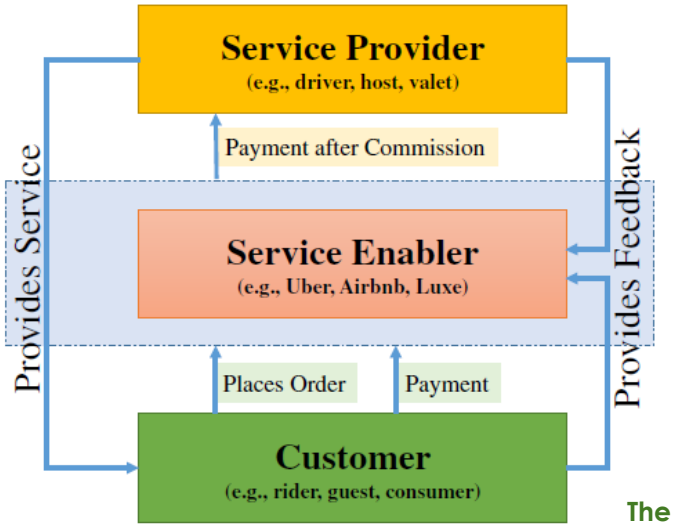
- The big mother was the car rental that evolved in car sharing
- Car sharing evolved from a rent-by-the-hour system to an ubiquitous system that includes shared use and even cars that drive themselves

- The automotive companies are rethinking their role to become mobility providers (no more only manufacturers of vehicles):
  - Mercedes-Benz: Car2Go; General Motors: Lyft, Maven, Turo (with Google); Citroen: Multicity; BMW: ReachNow; Ford: Chariot; Audi: Silvercar
- Public transport companies are supporting or creating car sharing companies:
  - SNCF: car sharing with IDPass; Transdev; Keolis
- Car rental companies:
  - Enterprise Car Share, RideShare (vRide); Hertz on Demand
- Small companies grow: Getaround
- New players out of transport sector are emerging (e.g. Apple)

The business model

- Sharing mobility is continuously challenged by the dynamic forces of the context in which it operates:
  - complexity of predicting customer demand;
  - consumerization of digital technologies;
  - economic and environmental constraints.

- those providing shared services need to adapt their business models to meet customer expectations in a more efficient, convenient, and sustainable manner



The customer can either be: businesses (B2B) or individuals (B2C)

Is sharing economy (and mobility) an added value ?

- **Large markets are necessary** to expand the business and make it profitable (role of market segmentation)
- Being not rentable the sharing services in densely inhabited areas, how can they survive in suburban and rural areas ? … where they could be an added value

BUT

more users are less sustainable the transport system is

- *The sustainability orientation of sharing economy platforms represents an early phase of the development of the platform*
- *The development from early ideas of sharing and accessing to transactions and professionalization is a transition on the platform level in which platforms potentially become increasingly focused on issues other than sustainability as they develop and attract other users and producers* (Geissinger et al., 2018)

The evolution of shared mobility towards SAV

- **Toyota Motor Corporation (TMC) and Uber** have agreed to expand their collaboration with the aim of advancing and bringing to market autonomous ride-sharing as a mobility service. Toyota has decided to invest $500 million in Uber (August 2018).
  https://www.intelligenttransport.com/transport-news/70814/toyota-uber-autonomous-ride-sharing/

- A framework agreement between **Uber and Volvo Cars** has been signed that will see Uber buy 24,000 base vehicles with driverless capabilities between 2019 and 2021 (Nov. 2017)

- Pony.ai has launched an **autonomous ride-sharing fleet in China**. Showcased at an event in Nansha, attendees experienced Pony.ai's fully self-driving cars on a 2.8 km route. Strategic partnership between the young company and China's second-largest carmaker, Guangzhou Automobile Group (GAC Group) (March 2018).
  https://www.intelligenttransport.com/transport-news/65712/autonomous-ride-sharing-fleet-china/

The sustainable mobility: ***the role of transport policies***

SUMPs: Sustainable Urban Mobility Plans → include E-Mobility issues and the new forms of mobility in an integrated way

Free public transport:

- Free public transport in Paris is costing authorities €4 million a day and with the pollution settling above the city it's going to be a costly affair (December 2016)
- Germany is reportedly mulling plans for fare-free public transport

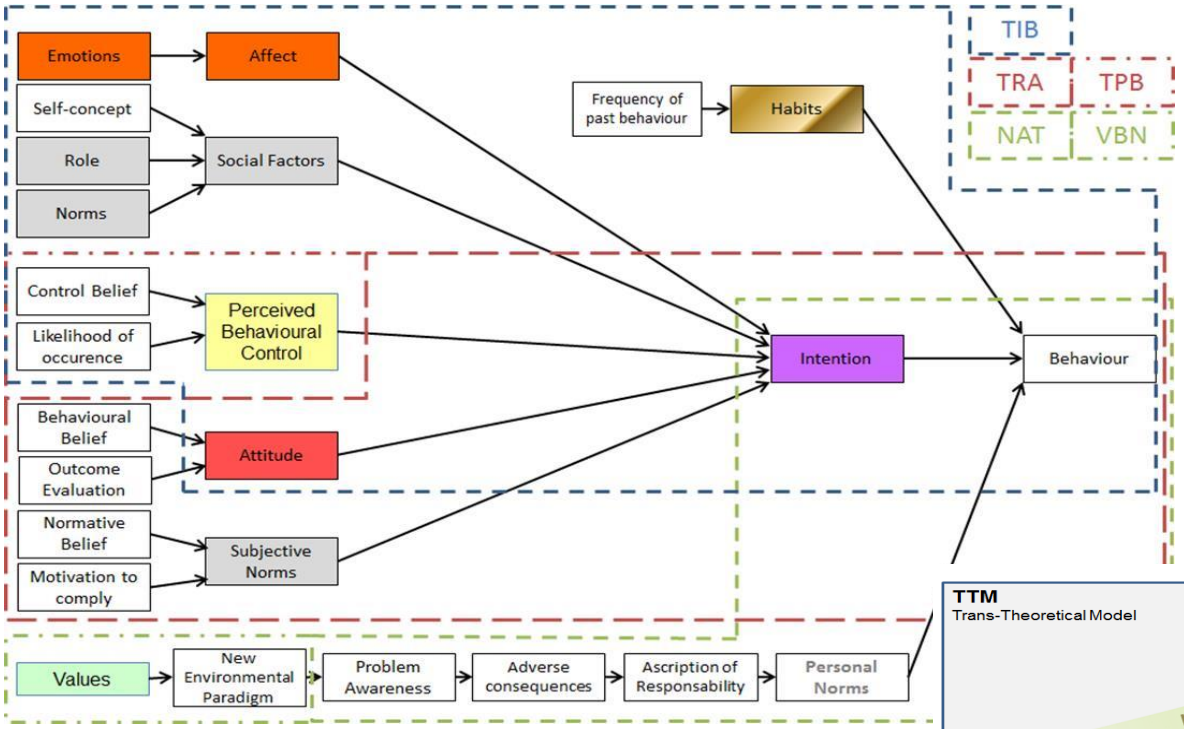
But to reduce pollution, it might be better off investing in improved services and penalizing car use, expert Oded Cats explains.

http://www.dw.com/en/can-free-public-transport-really-reduce-pollution/a-42584328

The key point

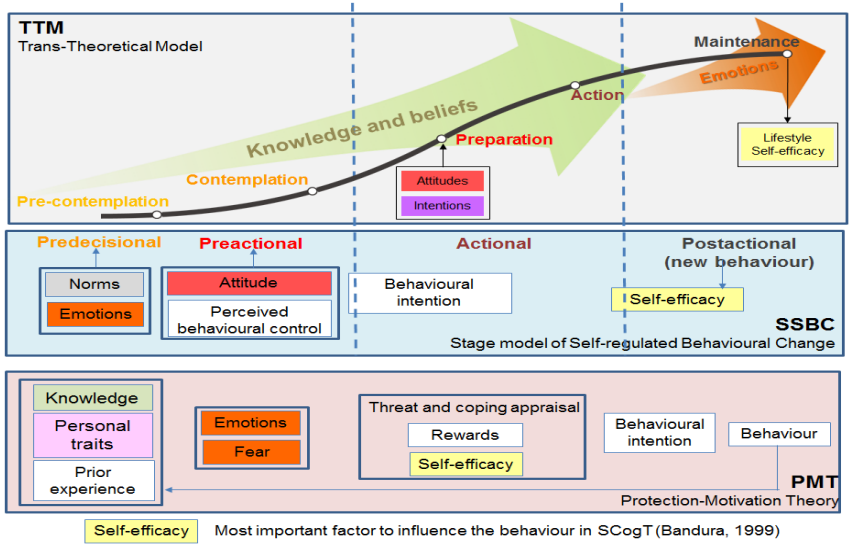
- Analyse in depth people's travel behaviour is fundamental to:
  1. understand the "levers to move"
  2. understand to which extent "enforcement" could be necessary
  3. how use supply to influence the demand (an hidden enforcement …)

The answer: ***we need more data to understand the travel behaviour and evaluate the solutions***



Individual-focused theories of decision making

Individual-focused theories of behavioural change



The sustainable mobility: ***how to change the behaviour ?***

Attitudinal analysis to profile the market shows four profiles:

1. the travel pleasure addicts: the highest attitude to change mode
2. and 3. the time addicts and timeservers: the highest car dependence and low intention to use alternative modes
4. the green consciences: importance of the environment and willingness to pay to preserve it, but no change habits and abandon the car → "who pollutes pays".

Car is the most used mode by all the defined clusters. It is transversal to the sample and it has no sense try to classify people in function of the mode they use

Pronello, C., Camusso, C. (2011) Travellers' profiles definition using statistical multivariate analysis of attitudinal variables. Journal of Transport Geography. Volume 19, Issue 6, November 2011, Pages 1294-1308

The sustainable mobility: ***how to change the behaviour ?***

Attitudinal analysis to profile the market shows four profiles:

1. the travel pleasure addicts: the highest attitude to change mode
2. and 3. the time addicts and timeservers: the highest car dependence and low intention to use alternative modes
4. the green consciences: importance of the environment and willingness to pay to preserve it, but no change habits and abandon the car → "who pollutes pays".

Car dependency is mainly related to necessity than pleasure → BUT travel pleasure addicts show flexibility to use any mode allowing them to enjoy of pleasure of freedom, discover, adventure

Pronello, C., Camusso, C. (2011) Travellers' profiles definition using statistical multivariate analysis of attitudinal variables. Journal of Transport Geography. Volume 19, Issue 6, November 2011, Pages 1294-1308

The sustainable mobility: ***how to change the behaviour ?***

Attitudinal analysis to profile the market shows four profiles:

1. the travel pleasure addicts: the highest attitude to change mode
2. and 3. the time addicts and timeservers: the highest car dependence and low intention to use alternative modes
4. the green consciences: importance of the environment and willingness to pay to preserve it, but no change habits and abandon the car → "who pollutes pays".

The most difficult group to divert to more sustainable modes is that of timeservers; their "conversion" could pass through a sensitization about the car costs to overcome the indifference and passivity in mode choice

Pronello, C., Camusso, C. (2011) Travellers' profiles definition using statistical multivariate analysis of attitudinal variables. Journal of Transport Geography. Volume 19, Issue 6, November 2011, Pages 1294-1308

The sustainable mobility: ***how to change the behaviour ?***

- User emotions towards travelling are the most important discriminant factor amongst groups

- The decision makers should focus on quality and image of public transport to attract also the timeservers who choose the most useful opportunity and rarely they will abandon their car if not properly informed and stimulated

- The real trade off is between the cost for improving the public transport supply and the amount of users that could change behaviour.

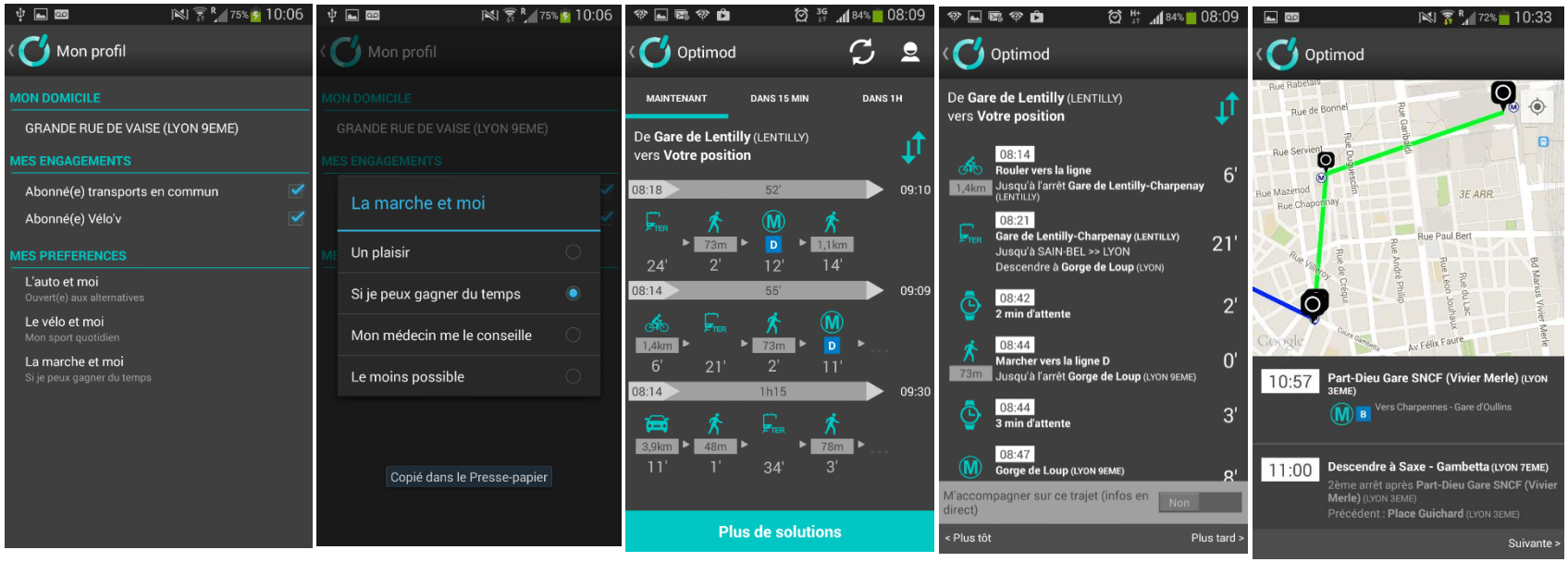
- This is a challenge for the medium-size urban contexts where "network effect" is hardly reachable using fast modes as metro, but could be obtained through an efficient organization of the service with traditional buses and, where is possible, introducing light rail services.

Pronello, C., Camusso, C. (2011) Travellers' profiles definition using statistical multivariate analysis of attitudinal variables. Journal of Transport Geography. Volume 19, Issue 6, November 2011, Pages 1294-1308

Understand the effect of technology on travel behaviour: Lyon

MULTIMODAL CALCULATOR

All the solutions to go from A to B, according to the user profile
Leaving in 15', 1h for the whole solutions
Detail of each solution with the stops, and leaving sooner or later
Possibility to define the departure or arrival time



Understand the effect of technology on travel behaviour: results

- Behavioural constructs for the modal change using OPTIMOD'LYON
  - Principal Component Analysis
  - Quartimax Rotation

Personal Attitudes related to mobility

Items	Construction	Factor 1	Factor 2	Factor 3
I expect that my family and friends put me under pressure to reduce the environmental impacts of my travels	**SN**	.898		
I expect that my family and friends incite me to use OPTIMOD'LYON	**SN**	.762		
I expect that policy makers incite me to use OPTIMOD'LYON	**SN**	.754		
I expect that policy makers put pressure on me to reduce the environmental impacts of my travels	**SN**	.753		.346
I don't like driving for my most frequent trip	**ATT**		.883	
I don't like to travel by car	**ATT**		.882	
I would use the PT more often if I had real-time information	**PBC**			.809
I would use more the Velov' if the real-time was available	**PBC**			.784
Eigenvalues		2.713	1.795	1.286
Percentage variance explained		33.9	22.4	16

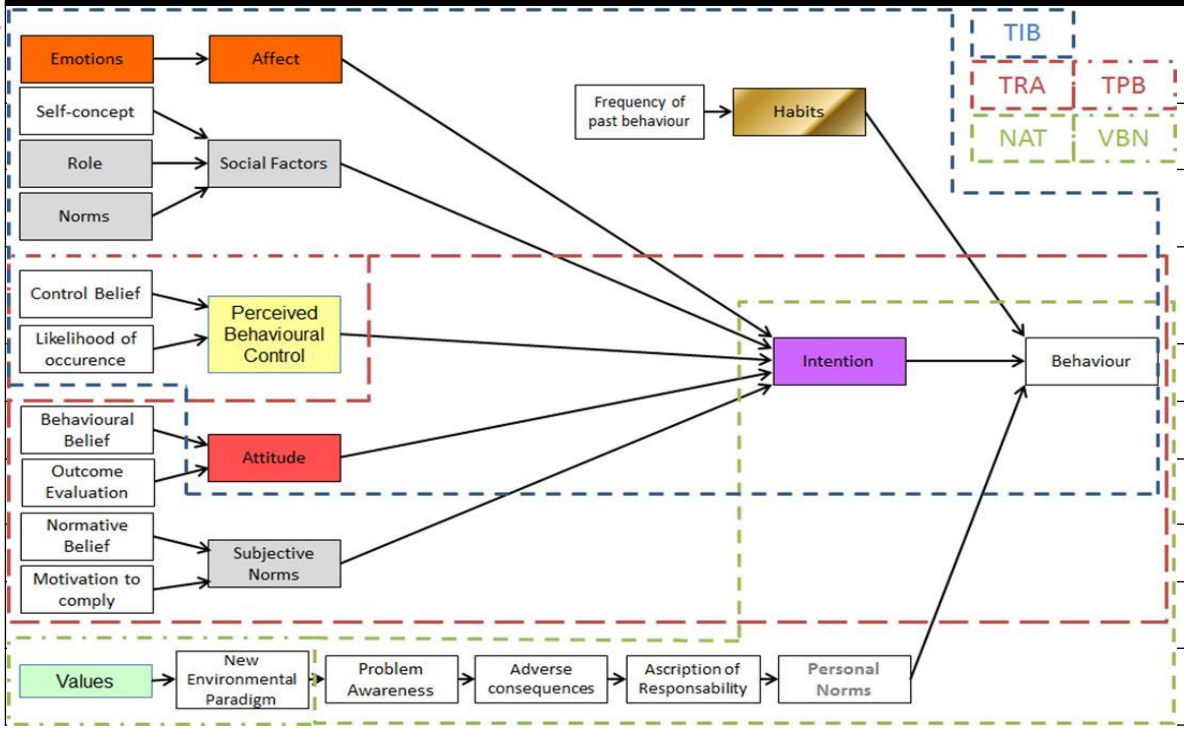
Predictor	Coefficient	SE	Coef/S.E.	*p-value*	Exp(coef)	95% CI Exp(coef)	
						Lower bd	upper bd
ATT	.835	.373	2.24	.043	2.31	1.08	4.92
Constant	-1.068	.954	-1.12	.302	.344	.050	3.29

$$\Pr[\,Maintain] = \frac{e^{-1.068+.835ATT}}{1+e^{-1.068+.835ATT}}$$

Understand the effect of technology on travel behaviour: results

- Behavioural constructs for the modal change using OPTIMOD'LYON
  - Principal Component Analysis
  - Quartimax Rotation

Personal Attitudes related to mobility



Items	Construction	Factor 1	Factor 2	Factor 3
	SN	.898		
	SN	.762		
	SN	.754		
	SN	.753		.346
	ATT		.883	
	ATT		.882	
	PBC			.809
	PBC			.784
		2.713	1.795	1.286
		33.9	22.4	16

Predictor	Coefficient	SE	Coef/S.E.	*p-value*	Exp(coef)	95% CI Exp(coef)	
						Lower bd	upper bd
ATT	.835	.373	2.24	.043	2.31	1.08	4.92
Constant	-1.068	.954	-1.12	.302	.344	.050	3.29

$$\Pr[\,Maintain] = \frac{e^{-1.068+.835ATT}}{1+e^{-1.068+.835ATT}}$$

Understand the effect of technology on travel behaviour: results

Introduction of OPTIMOD'LYON app under a **positive outlook**

- The participants are able to use the technology
- When choosing a mode the participants look for rapidity and flexibility
- The majority of the participants were curious about this system
- The majority expected to save time thanks to the use of OPTIMOD'LYON
- The participants agreed that real-time information would increase PT ridership

Expected impacts of OPTIMOD'LYON on mobility were **relatively low**

- Few commuters intend to change transport mode
- OPTIMOD'LYON is perceived as helpful for occasional trips
- There is not willingness to pay for it
- They do not believe that OPTIMOD'LYON could favour a modal shift

Understand the effect of technology on travel behaviour: results (ex-ante)

- Strong awareness and knowledge of the environmental problems, BUT **weak intention to act** (Kollmuss et Agyman, 2002);
- The real time information on the timetable increase the number of PT users (Abdel-Aty, 2001) BUT the participants have **not changed their intention** towards the modal choice because the real time information;
- Only 3 out of the 8 participants willing to change behaviour before the experimentation have still a willingness to change → OPTIMOD'LYON has **not disrupted the routine behaviour** and it has not induced a reasoned action
- The **past behaviour** has induced the future behaviour
  → the stability of intentions and of perceived behavioural control can explain the stability of the observed behaviour

- The results confirm previous studies: the application is mainly used for **occasional trips**
- **Without complementary measures, information can have little or no impact on the transport network efficiency**

Understand the effect of technology on travel behaviour: Torino

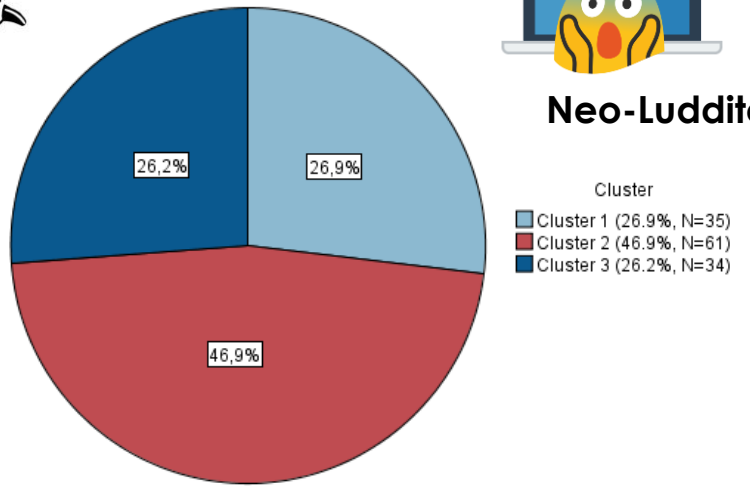
- Follow up of the study at European level within OPTICITIES PROJECT:
  - After Lyon, Torino, Madrid and Gothenburg were involved
- Same methodology used in OPTIMOD'LYON

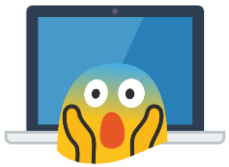
Understand the effect of technology on travel behaviour: results

Psychological-based market segmentation of ATIS users

Neoclassical Agents

Higher score on the utilitarian over the convenience transport related value
low score on the measure of attitude toward the environment →
homo economicus: an agent who will tend to maximize its own short-term utility without consideration for the others or the environment
Even if they may benefit from the multimodal navigator, it is unlikely that they'll will shift from their most favoured mode until economical constraints will force them to do so





They value whatever they can benefit from
Neo-Luddism identifies people that follows a desire for a simple life where technological tools are restrained to their minimum
→ *No use of TUeTO*

Neo-Luddites Opportunists

Hedonic Techy Ecologists

Higher score on the Convenience than on the Utilitarian transport value
they prefer cheap and pleasant trips than fast and efficient ones
They expect that technology will solve many problems, including transport-related ones, and are aware of the need to pay to benefit from a service such as the multimodal navigator. They can represent the main source of revenue in a business model assessment

Understand the travel behaviour: survey in Torino province

Travel Attitude Profiles from the Survey:

«Come Ci Muoviamo? Ma soprattutto…

Come Ci Vorremmo Muovere?»

Totale Contacts: 16.098

Complete Answers: 4.511

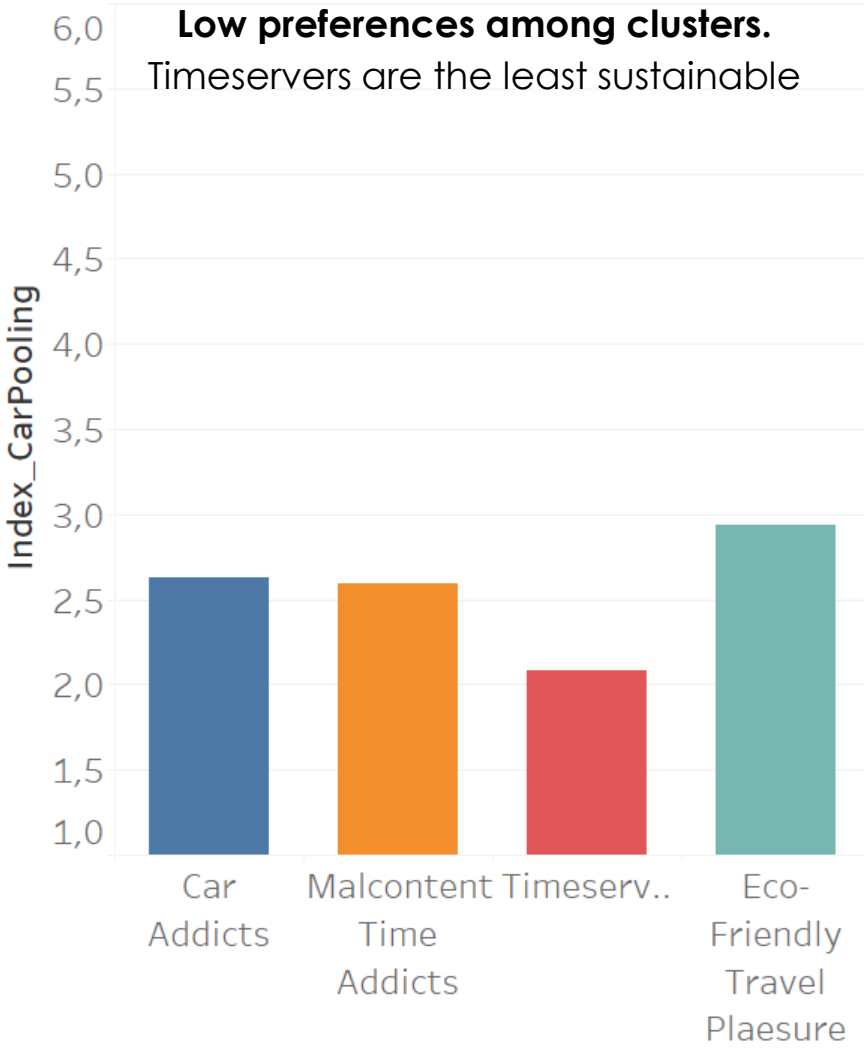
Four **Travel Attitudes Profiles**:

- *Car Addicts;*
- *Malcontent Time Addicts;*
- *Timeservers;*
- *Eco-Friendly Travel Pleasure Addicts.*

Shared mobility: how is it perceived ?

Low preferences among clusters.

Timeservers are the least sustainable

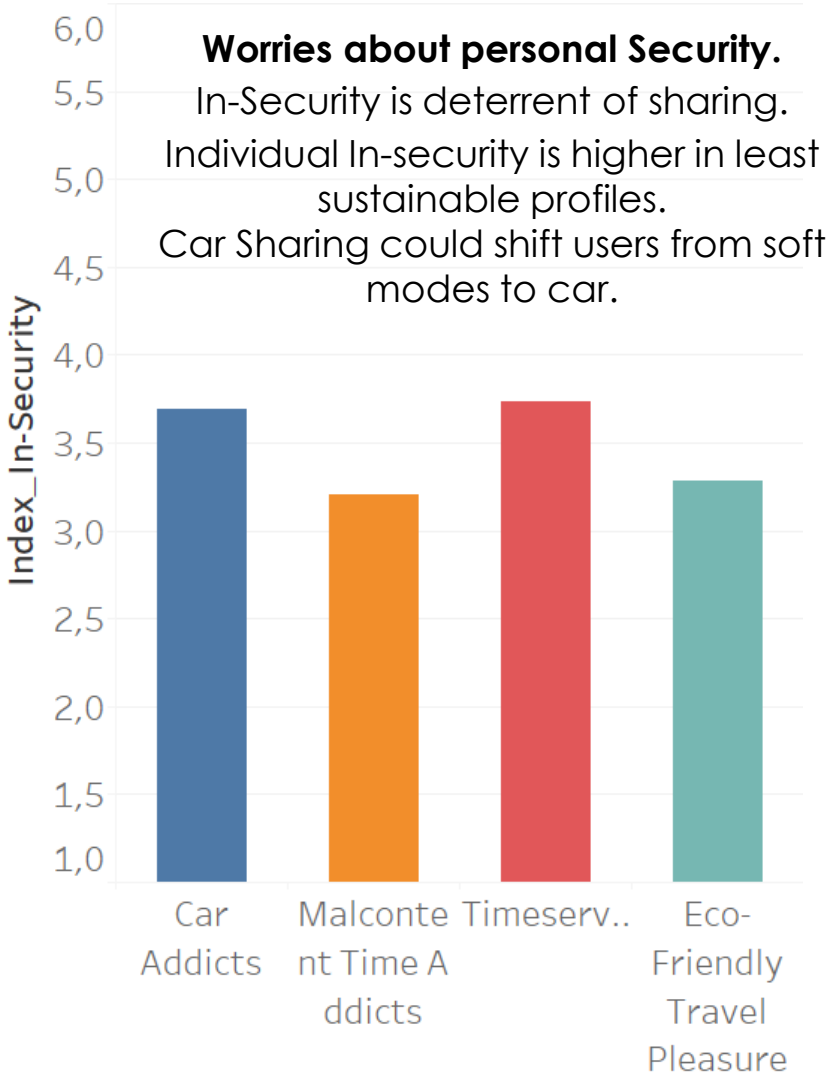


Worries about personal Security.

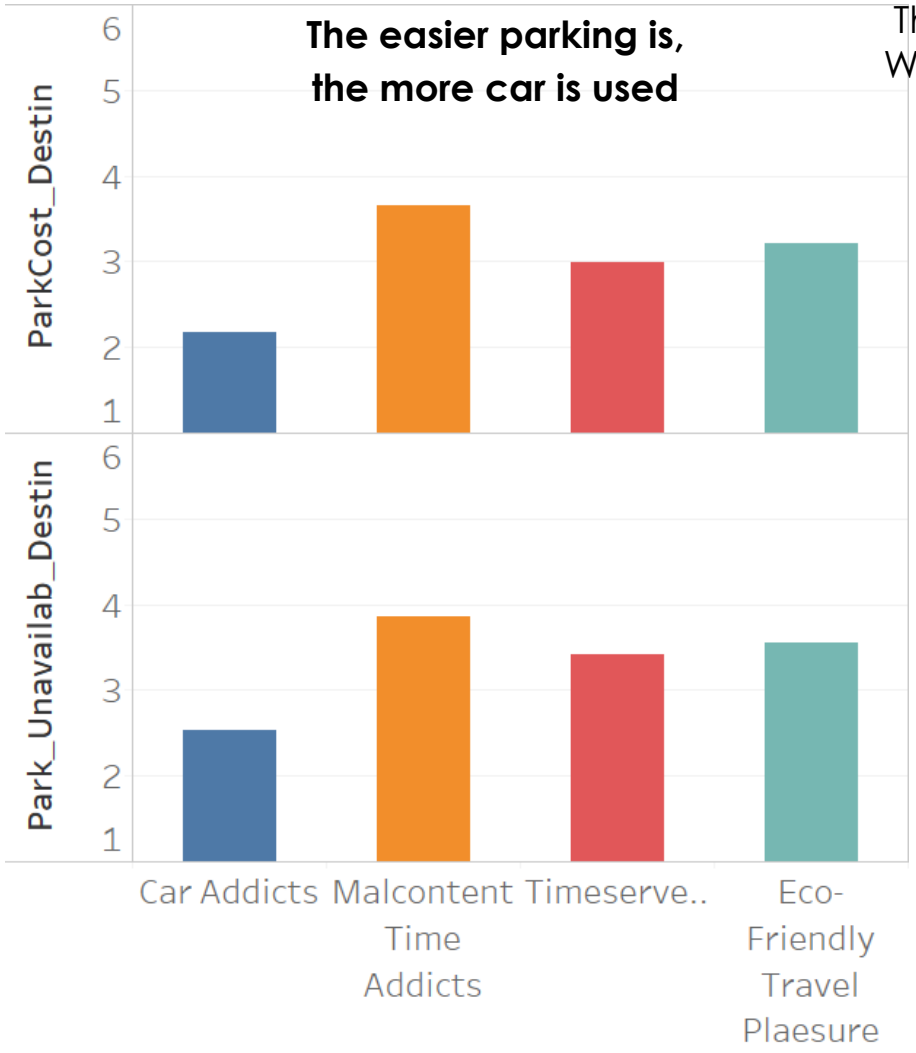
In-Security is deterrent of sharing.

Individual In-security is higher in least sustainable profiles.

Car Sharing could shift users from soft modes to car.

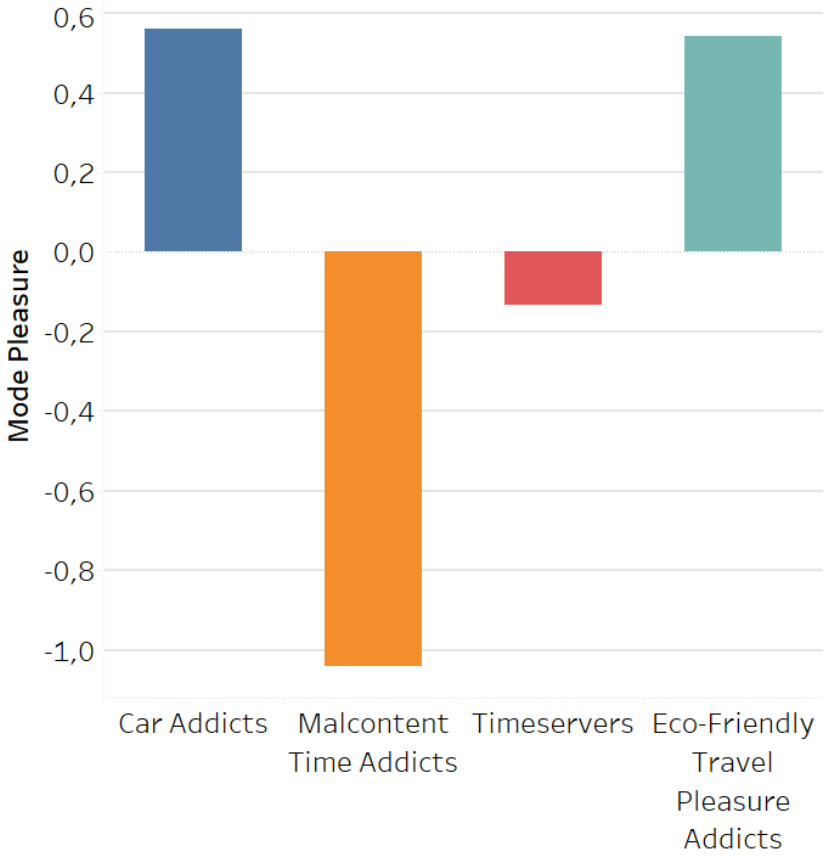


What does induce car use ?



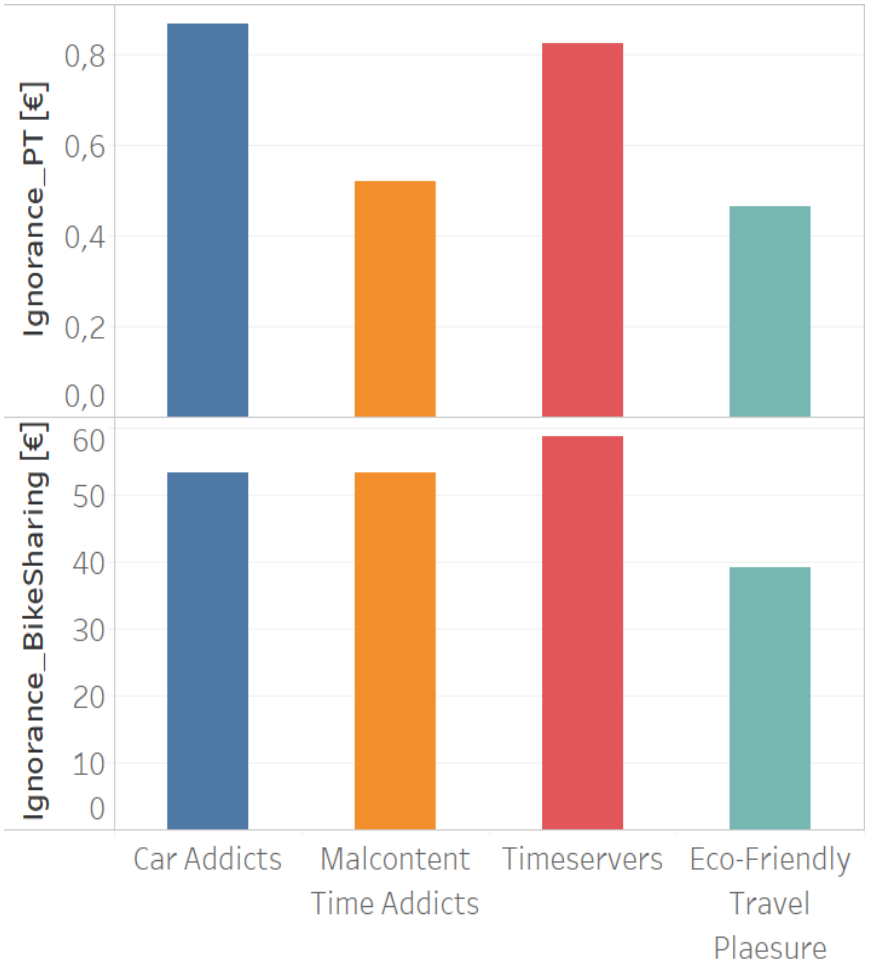
and about AV ?

They can park in suburbs and overcome hinges. Who does not like own current mode of transport will change to AV mobility systems

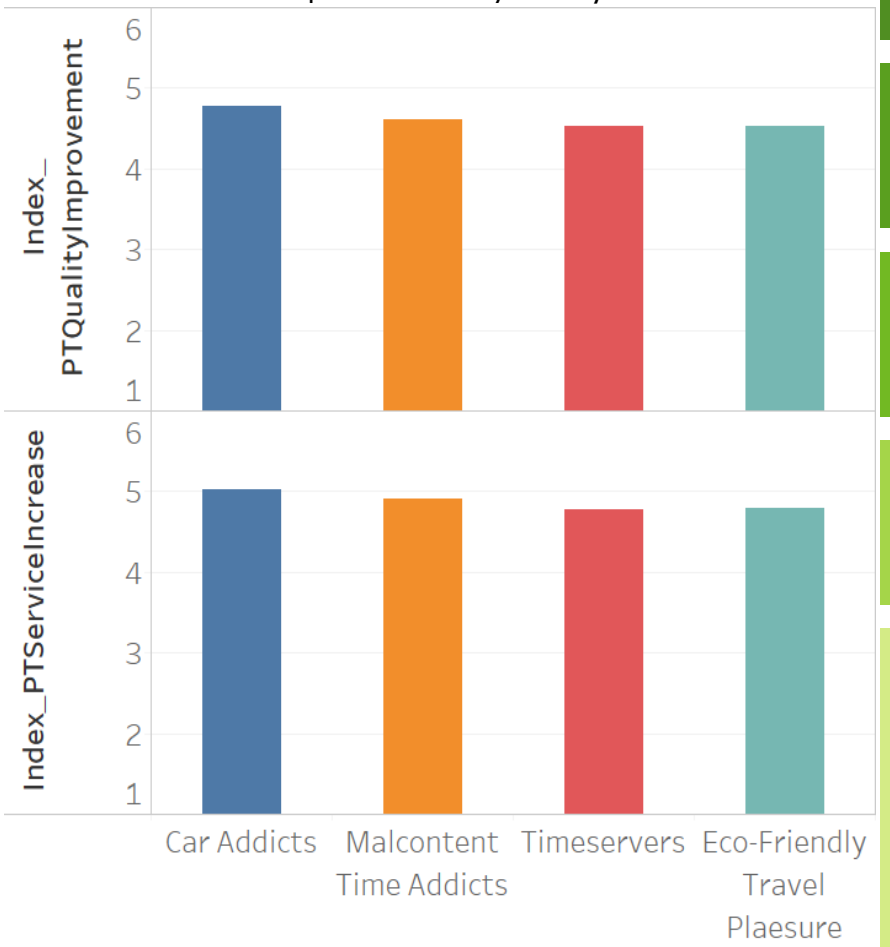


Instead, how does foster PT ?

More information on the alternatives:
you do not know modes of transport which you are not used to



Improve PT Service to use more it
Both PT Users and Car Users ask for better PT services and infrastructures (frequency, punctuality etc.)



The stakeholders responsibility

The role of public administrations/governments/EU:

- ***Integrate***: ***SUMPs*** → integrated transport policies + integration with energy, ICT and urban policies → FIND THE RIGHT MIX !
- ***Support*** the definition of ***integrated business models***: Mobility, E-Mobility, ITS, C-ITS, CAD (Connected and Automated Driving) or CCAM (Collaborative, Connected and Automated Mobility)
- ***Put together*** all the different ***actors***, including those of the value chain (E-Mobility)
- ***Inform, sensitise and educate citizens***
- Take in charge ***investments*** in sustainable mobility (vehicles, infrastructures, etc.)

EU homogenisation

Invest in R&D

The role of transport providers:

- ***Reorganise*** their service, deciding the priorities for lowering the air pollution
- ***Increase*** the quality of service (e.g. information, etc.)
- ***Invest*** in low-emissions vehicles and infrastructures
- ***Become*** service providers

Benchmark

To support citizens behavioural change

Because the technology is less and less the main issue …

The stakeholders responsibility

THE TIMES

Stop taking passengers for granted, rail bosses warned

Graeme Paton Transport Correspondent

Passengers are being discouraged from using trains by poor punctuality and high prices, according to the head of the government's rail review.

Keith Williams said that rail companies and the government could no longer take it for granted that passenger numbers would increase year on year. Speaking last night, he also appeared to criticise the government's "micromanagement" of the railways, saying that private operators were being blocked from introducing innovations.

They were the strongest comments yet made by Mr Williams, the former chief executive of British Airways, since he was appointed in September to lead a major review of the industry. His review — which will culminate in a white paper in the autumn — has been billed as the biggest of its kind since privatisation in the mid-1990s.

Anger has been increasing over the state of rail travel in Britain, with delays on the network the worst for 13 years at the end of last year. An average 3.1 per cent rise in rail fares was imposed last month — above the projected increase in earnings — and overcrowding is getting worse.

At a meeting of the all-party parliamentary rail group Mr Williams said: "There is a remarkable consistency that we've had in terms of feedback in that we need to reorientate the industry towards the customer. Indeed, I put it more strongly than that; there is a fear that if we continue as we are we will drive people away from the railways."

Ministers have spoken of the fact that the number of people travelling by train has doubled since privatisation. However, he cited figures from the Office of Rail and Road which showed that growth had been "flat since 2013" and numbers declined slightly in 2017-18.

He said that industry figures had criticised government micromanagement, which they said inhibited innovation. Companies are awarded franchises — contracts usually lasting between seven and ten years — to run a line against a series of specifications, which they say do not reflect developments on the railways. Mr Williams said: "The question for us is if that's the case, is it right and does it lose the innovation which was one of the reasons we brought the franchises in in the first place?"

Conclusions

- **STRONG POLITICAL SUPPORT →**
- Policy mix towards:
  - Integrated transport systems
  - investments in public transport
  - investments in cycling mobility (Strasbourg, Odense, etc.)
  - how using shared mobility (business model !)
  - interchange parking
  - attention to the use of public space
- Education policies to mobility and accompanying behavioural change:
  - how far can you walk? 1,5 km: 15-20 minutes on foot and 6 minutes by bike (3 km in 12 minutes)

THE BIG CHALLENGE IS CHANGING THE MOBILITY HABITS,

MAINLY IN MEDIUM-SIZE CITIES

THANKS FOR YOUR ATTENTION

CONTACT:
Cristina Pronello
Sorbonne Universités – UTC cristina.pronello@utc.fr
Politecnico di Torino cristina.pronello@polito.it