MaaS of the Month: PTV MaaS Modeller

Scenario analysis to support integration of ride-pooling in a mobility ecosystem

PTV GROUP
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MaaS ALLIANCE

How to integrate ride pooling in Barcelona's mobility ecosystem?

The MaaS of the Month of November introduces the analysis tool created by PTV Group to support cities and transport authorities to evaluate the potential of shared on demand mobility services and to help optimal integration of ride pooling to mobility system and MaaS services. In this case study we look at Barcelona in Spain.

With currently 1.6 million inhabitants, the demand for mobility services in Barcelona is on the rise. Since public space is limited and privately-owned vehicles contribute to a rather inefficient usage of space, PTV Group analysed how shared on-demand mobility services (specifically a fleet of 7-seater buses), integrated in the city's mobility ecosystem, can offer more mobility with relatively few vehicles, while also considering the environmental impact.

Solution

In order to optimise the pooling potential and calculate the impact on traffic and the environment, it is essential to rely on operational, passenger- and transport-based factors. The PTV MaaS Modeller is PTV Group's software solution to measure the impact of shared mobility by calculating, simulating and optimising fleet dispatching and matching it with traveller on-demand requests. PTV MaaS Modeller analyses new mobility offerings from three different stakeholder perspectives: from the perspective of the city, the traveller and the operator.

The software's primary input is the definition of shared mobility supply (vehicles), the road network (infrastructure), the demand (trip requests by the traveller) and the service provided the operator (detour factors, maximum waiting time, number of seats etc.). It then calculates an optimal shared mobility solution that serves all trip requests and minimises the number and cost of vehicle tours. In addition, the modeller helps users to understand localised impacts at high demand locations, such as curb side pick-up/drop-off. The modelling framework also analyses the economic tipping points of shared mobility services to help test the robustness of shared mobility business models.

The main assumptions of the model are as follows: all vehicles of the ride pooling fleets would have six passenger seats; booking is possible up until one minute in advance; and the maximum waiting time between booking and the arrival of the vehicle at the pick-up point is ten minutes. The pick-up and drop off process will take up to 60 seconds and the maximum detour time is 15 minutes.

Stakeholders involved

PTV Group together with the research initiative CARNET assessed the potential for shared mobility services in Barcelona to define an optimum demand responsive fleet configuration.

Stakeholder	Role
PTV Group	The software company's analysis tool, PTV MaaS Modeller, and its traffic planning tool, PTV Visum calculated and analysed the shared on-demand mobility scenarios.
Cooperative Automotive Research Network (CARNET)	The research and collaboration platform has developed a multimodal mobility model of the First Crown of the Metropolitan Area of Barcelona, which serves as the basis for the ride pooling analysis.

KINEO	As a partner, the company provides anonymised geolocation data from mobile phones that was used to set up a network model and modelling area of Barcelona.

Scenario analysis

The software assessed the potential of shared mobility services in the city of Barcelona with the goal to define an optimum service configuration that leads to a successful business model.

The four areas studied were:

1) the metropolitan area of Barcelona (10% of the travel demand with a trip length of more than 2 km)
2) the city centre (10% of the total travel demand with a trip length of more than 2 km)
3) the area covering the most visited tourist attractions, such as Sagrada Familia, Park Güell, parts of the city centre, the beach and Montjuic (20% of the total travel demand)
4) the areas with a particularly high demand for public transport that is not always met (poor services for 25% of the travel demand with at least 1 change)

Results

As you can see in the figure on the following page, in the first table the results of four shared-mobility scenarios look like this: to serve 10% of the mobility demand in the metropolitan area of Barcelona, a fleet of about 4,300 vehicles is necessary and every vehicle should transport on average over 55 passengers per day. For the city centre, a modal share of ten percent for ride-pooling would require a fleet of about 720 vehicles and every vehicle would serve over 70 passengers per day. To offer a service in the area of the most visited tourist attractions, the city of Barcelona needs a fleet of about 200 vehicles, assuming that 20% of the passengers will adopt the new transport mode. For areas with fewer public transport services, where at least one transit is necessary, a fleet of about 400 vehicles would be needed to serve 10% of the passengers. Each vehicle then serves about 35 passengers per day. As demand responsive transport modes offer a more customised and flexible service, the number of pick-up and drop-off points is widely spread across the city. In total, 2,904 pick-ups and drop off-points cover the metropolitan area. This makes the service highly accessible and inclusive for a large number of customers. As you can see in the second table, thanks to intelligent route optimisation, to serve a very similar demand in all four areas, the number of vehicles needed can be reduced by 30%.

Benefits to Society

Although the results are the outcome of an analysis which has not been yet validated by real-life implementations it can be said that a ride pooling service can be an attractive addition to Barcelona's mobility services. It could serve as a feeder for public transport lines, reduce private vehicle traffic and decrease the negative impact on the environment.

According to the analysis, **ride pooling can lead to a 10% reduction of private vehicle trips** in the metropolitan area of Barcelona**. This would have a positive effect on the overall traffic situation reducing congestion and increasing the use of public transport.** The seamless integration of a ride pooling service with a city's mobility ecosystem, especially public transport services, improves the efficiency of the transport system and leads to better service quality. Introducing

additional measures, such as parking restrictions and car-free zones in the city centre, is expected to enhance the impact of on-demand services considerably.

Vehicle Fleet Size

Scenario	Barcelona	Barcelona City Center	Barcelona Sightseeing	Inefficient Public Transport
Required fleet size	4,299	720	190	409
Passengers/Vehicle Day	57	72	79	34
Travel demand served	100%	100%	100%	100%

Scenario	Barcelona	Barcelona City Center	Barcelona Sightseeing	Inefficient Public Transport
Required fleet size	3,000	500	130	290
Passengers/Vehicle Day	91	104	110	46
Travel demand served	99,7%	99,8%	98,7%	99%

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More information

https://www.ptvgroup.com/en/mobilitynext/

The technology used for the 2017 study has been improved massively over the past 2 years with the result that with, Visum 2020, PTV now offers the opportunity to analyse intermodal journeys within a city, having a demand responsive transport system such as a Ride Pooling service as on possible mode to choose. This opens up even more possibilities to analyse the impact of such new mobility services on existing services and infrastructure and how those traditional services could be complemented or challenged.

"MaaS of the Month" is an initiative of the MaaS Alliance; it is a collaborative effort of the members of the Alliance's Working Group on Users & Rules and Working Group on Governance & Business Models.