Enhancing Mobility as a Service (MaaS) Concept through Social Interaction and Crowdsourcing Applications

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Abstract

Mobility as a Service concept comes to support optimization on addressing mobility needs through the proper handling and use of information. Aiming at a seamless mobility approach that is aligned with urban sustainability goals, social interaction and crowdsourcing applications may further support the MaaS concept, by making use of big data and by connecting common interest user clusters under a dynamic information exchange environment to assist travellers with their mobility and parking decisions. This paper discusses finding from two research projects that support this vision proposing sustainable solutions for urban mobility and parking by promoting shared mobility and parking options in Mediterranean urban areas.

1. Introduction

The rapid growth of private transport usage, especially in metropolitan areas, is linked with increased traffic congestion and pollution (Nguyen-Phuoc et al., 2018). Most urban environments, follow the heavily car-dependent urban model, that is also linked with imbalance between parking supply and demand which can be considered the initial reason for metropolis parking problems (Hossam El-Din, 2017). Adding to that, cruising for curbside parking further increases the overall traffic congestion (Dowling et al., 2017). It is common ground that one way of depreciating public space in the urban environment is to occupy it by parked vehicles, and particularly by abusive / illegal parking, as well as by traveling a long way in search of free parking spaces.

Considering the dense environment of most Mediterranean cities, and especially ones with historic and commercial centres, having limited public space to serve all urban functions, the need to seek for sustainable solutions in order to avoid their degradation is fundamental. Urban transportation is linked with city liveability (Gössling, 2020) and thus, transport related actions are required.

Mobility as a Service (MaaS) can be an efficient tool for managing travel demand and supporting modal shifts in favour of "greener" transport modes (ie. walking, cycling, micro-mobility and sharing mobility options) (Durand et al., 2018).

Towards this view and considering that the main urban mobility problems deal with the increased traffic and the lack of parking spaces, approaches that support and go beyond the MaaS concept may significantly contribute to urban sustainability.

This research comes to support the MaaS concept, while taking advantage of social interaction and crowdsourcing information, by promoting a sustainable urban mobility approach, combining; a) sharing mobility and b) sharing parking concepts, appropriate for Mediterranean cities, introducing at the same time a new "culture of living and moving" in urban areas.

Based on findings from two research projects; SocialCar and SocialPark (one European and one National) with a list of Mediterranean cities involved, this research provides insights that social input and proper use of crowdsourcing information may significantly support MaaS and enhance mobility and parking sharing concepts and urban liveability.

Promoting sharing mobility and parking options in Mediterranean urban areas through social interaction and crowdsourcing

Shared mobility options have been widely introduced in most urban environments to overcome the need of vehicle ownership and/or usage, providing at the same time convenient mobility services to travellers based on their needs (Shaheen et al., 2016), through a new mobility concept, covering a list of modes; like car, bike, moto and scooter (Shaheen and Cohen, 2019).

Additionally, promoting MaaS seems vital for urban sustainability. The MaaS concept usually supports a platform development,that integrates all modes and services to cover mobility needs of travellers in the best possible way (Mulley, 2017; Arias-Molinares and García-Palomares, 2020).

Reducing road congestion can be achieved by improving and maximizing connectivity and information sharing between carpooling and other transport services. SocialCar project followed this approach, by providing real-time information exchange and validating targeted and customized mobility solutions regarding behavioural changes of travellers in favour of car-pooling and eco-friendly travel choices. Adding to that approach, SocialPARK project supports overcoming further needs for parking arrangements, as it deals with the limited parking spaces problem in urban environments, through the activation of an ecosystem of interacting citizens, parking companies and municipalities, towards a mutually

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profitable management of the publicly available parking space.

Social interaction has been critical for both projects, supporting the participatory approach on urban mobility. Both approaches, make use of crowdsourcing information and data, supporting community activities (i.e. communication to exchange and verify traffic information, service rating, parking availability notice along with and additional information that may be exchanged and support improving travel/parking experience).

2. Methodology

Sharing mobility options have been tested through a smart mobile application, developed within SocialCar project as " a new communication network for intelligent mobility, sharing information of car-pooling, integrated with existing transport and mobility systems". Aiming at simplifying travel experience of citizens and having defined data processing flows and designed algorithms to match travel requests with the integrated public-private transport supply, complemented by a reputation-based mechanism, the application has been tested in 10 European sites (Edinburgh, Brussels, Canton Ticino, Zagreb, Torino, Brescia, Lazio Region, Luxembourg, Ljubljana, and Skopje) (Wright et al., 2017; Kalogirou et al., 2018), through three discrete test phases. Test A, aimed at identifying all application related bugs in order to meet user preferences, decrease complexity of use, improve clarity of information, memorize preferences and improve suggestions, improve usefulness and user friendliness and making the application more intuitive. Test B evaluated how effective the developed application could be in the future and Test C assessed how likely it was for travellers to change their mobility behaviour while using the application (Wright et al., 2017; 2018; Kalogirou et al., 2018). Focusing on Test C, a number of travellers from four test sites (Brussels, Ticino, Ljubljana and Edinburgh) used the application for a trial period, in order to cover their actual mobility needs. Users' selections provided useful knowledge for the behaviour of travellers, their preferences and possible mode shifts in favour of carpooling and combined carpooling and Public Transportation (PT) options.

Similarly, the sharing parking concept is being examined, as part of the SocialPARK's project "integrated Parking-as-a-Service platform for facilitating search of vacant parking lots based on crowd-sourced Information". Having as test site the city of Thessaloniki, in Greece, a typical Mediterranean city, all possible parking options have been captured along with the relevant users' and stakeholders' needs, wants and preferences. That feedback supported the development of the relevant Use Cases and project platform, to be further tested, capturing actual users' parking related requirements, social interaction and behaviour. Although it is an ongoing project and test phases have not yet been implemented to assess project impact, several preliminary findings are being available, proving the need for such solutions (Tsami et al., 2019).

3. Results

Counting on average around 1500 carpool trip offers from external carpool providers, and 15000 trip planning solutions being provided to users during the testing period of the SocialCar project, the total number of trip suggestions that included a carpooling offer were 2781 (approx. 19% of all solutions presented to users), while 15% of trip planning solutions, resulted in users pursuing carpooling (either by making an enquiry for a specific carpool trip to the external carpool provider or by booking an internal carpool trip via the application). A critical finding was that the majority of carpooling trip solutions offered to travellers were connected with PT (over 85% for Brussels, Ticino and Ljubljana and 69% for Edinburgh) (Wright et al., 2017; 2018).

The trial testing period of SocialCar application, indicated that mobility conditions and travellers' behaviour may shift to more sustainable solutions, decreasing the car usage and increasing sharing and public transportation mobility options. Additionally, results of testing showed that the application is likely to benefit more, corridors and daily time slots with the highest congestion. Still, car parking capacity at the most attractive connection points was the major constraint on achieving the potential impacts (Wright et al., 2018).

Findings from capturing parking conditions, needs and preferences of citizens in the urban area of Thessaloniki showed that 75% of urban travellers face difficulties in finding a parking space at the city centre, while 89% of them park their cars on street and only 11% in parking lots. Still, 83% of them indicated their willingness to use a parking space after improving current cost policy. Based on this research, 92% of citizens revealed their interest and willingness to use the SocialPARK application (Tsakiropoulou et al., 2018).

4. Concluding Discussion

Considering both sharing mobility and parking concepts, following both projects' findings, urban mobility could be significantly supported by advanced and enhanced MaaS concepts, taking advantage of social activation and interaction capabilities and crowdsourcing data and applications. Carpooling in a frame of being combined with convenient PT, parking availability sharing information and incentives for behavioural changes in favour of such solutions, may support the urban sustainability goal of the Mediterranean urban environments and beyond.

In that frame, policy measures supporting carpooling to make it more attractive to car drivers, such as priority parking at PT interchanges or at workplaces, are strongly recommended. Additionally, both approaches discussed, require proper legislative changes for sharing mobility and parking operations.

Among the advantages of the sharing mobility concept discussed, is that it does not require all car users to change their mobility profile, shifting them massively to other means of transportation, instead, it offers to the devoted car users the possibility to co-travel and reduce travel expenses, given them the possibility to offer rides to others and contribute to the overall congestion reduction. On the other hand, sharing parking arrangements, could support

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the sharing mobility concept, offering parking slots for those who carpool and continue with PT under better pricing policies.

Exploiting the "wisdom of the crowd" for providing mobility and parking solutions in real time conditions, under a monitored and accurate frame of operation, adds on the creation of a novel value-chain for mobility and parking towards sustainability.

Future steps of this research could be to integrate in one application both sharing mobility concepts, being part of MaaS green packages, to be further tested in Mediterranean urban areas, allowing comparisons among the different cities and covering city-oriented needs and preferences.

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Keywords

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