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Integration vs fragmentation: alternative tactics of local mobility businesses in response to a global wave of market disruptions

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Abstract

In this paper we present the results of a facilitation process for consensus building among local mobility stakeholders (public transport providers, taxi associations, carpooling organizations, local authorities, etc.) aimed at identifying business and deployment strategies for travel assistance services integrating regular and on-demand mobility solutions. This process was centered around a service model deployed by the SocialCar platform, providing planning and booking services for multimodal trips, combining collective transport modes with community-based services (carpooling). Local consultation events were held in ten European cities where stakeholders were asked to assess four potential deployment scenarios enabled by the SocialCar service model. The business patterns will define an investment blueprint for local business development in Europe facing the current fragmented environment in the local transport market and including the key elements of legally sound public-private data integration, monetization and financing.

Keywords: carpooling; shared mobility; travel assistance services; journey planning; local transport services

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1. Introduction

The last decade has seen a worldwide increase in the use of cars as the preferred means of transport in large parts of urbanized and non-urbanized areas. Furthermore, unprecedented urban sprawl has strengthened this trend, creating further areas of relatively low density, and consequently increasing car dependency. This has resulted in unsustainable use of transport modes, significantly harming the quality of urban environments and boosting the exclusion of already disadvantaged mobility users. A 2014 Eurobarometer survey reports that: i) cars are by far the most used mode of daily transport (54%) across Europe, followed by urban public transport (19%); and ii) conventional modes of public transport are considered rigid in terms of schedules and routes and therefore have limitations, especially in lower density suburban / peri-urban areas, but sometimes also in urban districts. According to Eurostat statistics from 2013, car ownership is continuously increasing with an average growth rate of 1.27% and no substantial difference between western and eastern EU countries. At the same time, car occupancy rates are thought also to be declining, leading to environmental and congestion problems: data provided by the European Environment Agency (EEA) report average values between 1.6 (western EU countries) and 1.8 (eastern EU countries).

Smart and sustainable urban mobility planning should start with thoughtful spatial and urban planning to reduce the need to travel. In addition, a co-modality approach should be encouraged by considering it as one of the key factors in reducing the overall kilometers travelled within a city by private and public vehicles. Among these solutions an ever-increasing role is being played by carpooling. The opportunity presented by carpooling relies upon a change in behavior, resulting in increases in the average occupation rate of cars. Current journey planning tools do not provide information for multi-modal journeys connecting individual (private) and collective (public) transport services. This serious limitation reduces the ability to exploit the full potential of the available transport network. Public transport is not able to satisfy all mobility needs and preferences while, conversely, more flexible and on-demand services, including carpooling, ride-sourcing and taxi services cannot efficiently provide sufficient passenger capacity.

SocialCar is an EU H2020 funded research project that aims to provide citizens with access to a unique service that optimises the use of all available mobility resources in the sharing mobility framework. A mobile app provides planning, booking and (in the future) payment services for multimodal trips and will have the unique ability to combine regular and collective transport modes with on-demand or community-based services (taxi, car and bike sharing and also carpooling). This capability, together with complementary services including real-time travel time updates and potentially also incentives for green travel choices, makes SocialCar an innovative and comprehensive travel assistance service, and an enabler for the provision of Mobility as a Service (MaaS) capabilities.

After introducing the SocialCar service, with specific insights on its market and technical aspects of the service (Section 2), we present in this paper: the maturity tests set up for validating the new solution (Section 3); as well as knowledge gained for the necessary market roll-out exercise (Section 4). The latter focuses on the presentation of business scenarios, which explore the different roles that could be played by both private and public actors, and therefore lay foundations for potential fruitful cooperation. The paper is concluded (Section 5) with commentaries on the limitations of the current market and governance context and a discussion outlining possible strategies for future take-up of combined public-private cooperation.

2. The SocialCar model

2.1. Market Overview for Innovative Travel Assistance Services

SocialCar is entering a crowded and quickly evolving marketplace for mobility apps. Nevertheless, a comparison of several leading travel assistance services reveals that the number of transport modes covered remains incomplete, as competing businesses seek to build alliances with public transport, car sharing and car rental organisations. Similarly, the functionality offered to users with regards to the sophistication of multi-modal trip planning, “end to end” payment functions and travel cost comparison remains incomplete. This represents opportunities for innovative travel assistance services, and also raises questions about how the technology could best be deployed, in terms of specific customer segments and needed partnerships in the market.

The sharing economy has rapidly gained in importance over the last few years, affecting traditional market sectors including mobility and logistics, retail and consumer merchandise, tourism and leisure. User experience,

rather than product ownership, has become a market driver for new value propositions and innovative business models, capitalising on new internet and smartphone technologies, and rapid behavioural change.

Reshaping cities based on openness, collaboration, and sharing is a resurgent cultural trend that will strongly influence the nature of new mobility services that respond to emerging needs and support the user experience of people travelling in urban areas. The emergence of web and app-based travel assistance services are themselves triggering changes to the operational models of conventional transport providers, such as public transport providers and taxi companies, by promoting greater cooperation and flexibility. A gradual, but influential wave of new travel services are forcing traditional transport businesses to reconsider their role as independent B2C mobility providers and leading them to form new alliances within increasingly complex and all-encompassing mobility solutions. The on-going evolution of travel assistance services, from online travel information covering a range of transport options, to integrated, multi-modal travel solutions and towards holistic MaaS schemes, is represented in the following Figure 1. There is no single authoritative classification of travel assistance services. As in a crowded marketplace these are emerging in several forms and continuously evolving. This section presents a classification based on historical evolution:

Trip or Journey Planner internet and mobile applications assist users in searching for the best route from an origin to a destination at a given moment (day and time). A preferred travel option can be chosen according to many parameters although usually the most popular are to compare options in terms of time and / or cost (and for a recently increasing number of apps, environmental impact also). Such applications are often based on advertising or affiliate marketing business models, the latter being based on payments from transport operators whose services are most prominently displayed. There are also a range of companies offering "whitelabelled" travel support products to city and transport authorities who wish to launch a service with their own local branding.

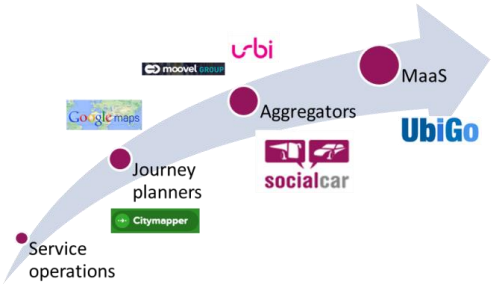

Fig. 1 Travel assistance services per category and market player positioning

Recent evolutions in urban transport services and IT platforms have enabled new families of products acting as Aggregators. When compared to traditional Journey Planners, these have multi-modal capabilities and matchmaking features, applying dynamic models when offering a range of travel options that can involve, for example, trips involving ride-sourcing + public transport. Aggregators may include intermediation services, facilitating georeferenced mechanisms for meeting customers' expectations. Besides innovative value propositions, there are exciting debates around business changes in the arena of urban mobility, as the roles of key players are not yet well defined and there is potential that companies benefitting from high financial investment, running ahead of national and local regulation, could distort the market, generating impacts on urban mobility and sustainability. Traditionally the role of public authorities was to define the regulatory mechanisms for enabling mobility in cities while seeking to ensure equity, efficiency, environmental protection and liveability (including by supporting public transport provision). New trends pose other questions relating to data sensitivity, market balance and maintaining competition, and so on. For these reasons, market analysis and business plan preparation must seek to take into account the interplay of business activity, emerging regulation, and the role of urban and transport planning, in a range of possible future scenarios. Global players have efficient business strategies, but their aims are not always considered to match public interests and objectives with regard to social inclusion and sustainable urban development. This situation famously appeared in several cities with the uptake of Uber, an intermediation service supported by a very high level of investment that entered local markets with practices sometimes considered aggressive or even illegal. There is a sense that local authorities are playing catch-up in terms of assessing the long-term impacts of such services and setting in place appropriate regulatory frameworks. Nevertheless, there are also examples of cities that have taken a cautious approach and prevented Uber from operating.

2.2. Market positioning: SocialCar is a synergy builder.

With 10 pilot Sites in total, SocialCar takes advantage of its geographic spread and diversity to explore the most promising business models and approaches for deploying its travel assistance service. SocialCar aims to improve the whole transport network offer, and its efficiency, as well as providing a service centered around a citizen's needs that has the potential to improve social inclusion. A key aspect of the SocialCar ethos is that the technology and services can and should be deployed flexibly, in order to satisfy the needs of individuals, city authorities and public transport authorities, to whom tailored services and business models can be offered to suit local circumstances and existing mobility service providers.
Disruptive innovation is a 'process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors' (Christensen, C., 2017). Disruptive innovation makes affordable a product that was previously expensive and/or complicated available to a wider market. Disruptors exist in different sectors. Within the vehicle industry, the rise in the development of autonomous vehicles led by organisations such as Tesla, Uber and Waymo (the Google self-driving car project) is well known. However, many of these disruptive innovators aim for, even if not presently possible, commercial gain as priority over societal benefit.
SocialCar does not seek competitive advantage only, but is instead trying to establish business scenarios that could be taken up by local public and private actors to provide better transportation services and responses to users' travel needs. With its societal emphasis, the focus of SocialCar is not as a disruptive service innovator that displaces established market players in the field. SocialCar is a synergy builder and adopts a different angle by using its market awareness to reshape travel assistance services based on openness and collaboration as a firm actor in the sharing economy. To provide an example, in situations where car sharing or carpooling initiatives are not yet well established or developed in a city-region, both conventional taxi services or ride-sourcing car services could be included by SocialCar as viable alternatives to carpooling.

2.3. The SocialCar technical solution: data integration and algorithm overview

SocialCar operates with different types of data, logically organised in two main categories, the Supply side data and the Demand side data. The supply side includes: i) Transport infrastructures (road/rail networks, bike/pedestrian paths), ii) Transport service data (PT lines and schedules, carpooling services, etc.) iii) Transport status (traffic intensity, disruptions, etc.). The demand side includes: i) Transport requests, ii) User related data (position, reputation, etc.). In order to integrate all the various multimodal transport possibilities, the logical organisation of data described above needs to be structured as a multi-layer temporal network, as described in Gallotti and Barthelemy (2015). The SocialCar algorithm needs an underlying network in order to create alternative route solutions for users willing to move from origin to destination selecting alternative transport means. Carpooling services are a hybrid transport mode halfway between public transport lines (car poolers driving to work tend to stick to fixed schedules) and private transport (car poolers are not bound to a specific route, they can change dynamically taking into account varying traffic conditions, and are represented in SocialCar as bus services with appropriate adaptations in order to include information about the driver and his/her ride, including residual car capacity). In Fig.2 we describe the overall interplay of the SocialCar algorithms. The user can submit a transport request that is handled by the route planning algorithm, which will plan the optimal route according to user preferences, taking into account the available transport options. The algorithm plans on the basis of available information, ideally also utilising information on the real time status of private and public transport network and returns a number of route alternatives, which may involve some carpooling services. In those cases, a ride matching algorithm is invoked. Its task is to distribute potential concurrent requests for seats on carpooling vehicles and if needed, to dynamically assign travellers to car poolers, adding stops on a car pooling route. If a match is found, the carpooling offer needs to be updated accordingly (to show less seats available in the specified vehicle).
Concerning the algorithms for the SocialCar framework, the main challenge was to develop a method integrating the multimodal route planning and the carpool matching. This was achieved through the use of algorithms of the Dijkstra family (Dijkstra 1959), eventually made more complex to take uncertainty into account. In particular, the main work has involved the preparation of the graph representing the network on which the algorithm itself runs. A further challenge in the SocialCar context was to plug reputation information about users into the route selection optimization process. This aspect was solved by considering these items of information as weighted contributions to the optimization targets, after applying the necessary tuning phase. Again, such an approach can be easily integrated into the methods of the Dijkstra family. Notice that using different sets of weightings can lead to alternative solutions, which is good because these different solutions can be proposed as alternatives to

the decision maker (for SocialCar, the passenger), that selects the one most suitable to their need/ideas.

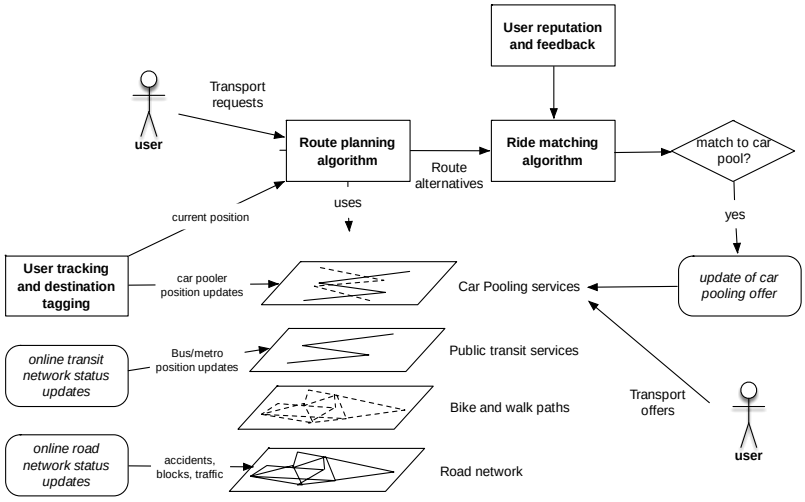

Fig. 2 A general overview of the interplay of the SocialCar algorithms

The main elements of the technical solution developed by SocialCar can be therefore summarised as follows:

- Combining multimodal route planning and carpool matching in an urban framework.
- Integrating external dynamic data feed from carpooling providers, in order to increase the likelihood of ride matching.
- Including user reputation mechanisms in journey elaborations.

The abovementioned innovations rely strongly on the availability and accuracy of data related to transport infrastructure and services. This is a prerequisite for the effective roll-out of such a service, meaning that global players with high investment capacity and, therefore, access to proprietary transport data can dominate the market. When data is not made more freely available, this leaves little space for local entrepreneurial development of travel support services. Moreover, the fragmentation of local transport services leads to lack of customer satisfaction and fragile customer loyalty. This is where global players succeed to engender lock-in-effects, both on transport and travel assistance services, driven by customer satisfaction tactics rather than efforts to solve local problems relating to land use, congestion and accessibility. The SocialCar model, using its technological and behavioural drivers, proposes instead a collaborative alliance between public and private entities, aimed at sharing information and integrating services while preserving market competition.

3. Maturity test

The validation of the SocialCar system and methodologies have taken place in 10 test sites: Canton Ticino (CH), Skopje (MK), Edinburgh (UK), Lazio Region (IT), Zagreb (HR), Luxembourg (LU), Brussels (BE), Brescia (IT), Turin (IT). All sites were engaged in development, testing and upgrading activities relating to the SocialCar system. The sites have been selected to guarantee that they cover the entire project value chain and that applications are using the full range of SocialCar components. Selection criteria were: a) Maturity Layer: looking for different profiles of stakeholders covering a wide range of European cities and ensuring European added value, transferability and roll out, b) Validation Layer: according to different prerequisites in terms of existing mobility data and services, a modular validation of the project results was designed. This involved moving from a basic debugging of the platform up to a small-scale real validation test, which is required to ensure effective market penetration beyond the project timeframe. The tests and validation were performed (Test C defined below will be completed during the Autumn 2017) according to the level of maturity of each site as follows:

- Test A) SocialCar desk validation: all sites provided technical and functional debugging to the system by implementing at least one test iteration. The system was deployed in the 10 sites and local skilled volunteers tested the app by producing and validating multimodal itineraries involving PT and carpooling options in their cities.
- Test B) On site test - Impact simulation, based on real data using existing traffic models: 5 sites (Canton Ticino, Edinburgh, Zagreb, Brussels, Turin), fed their traffic simulators with real data from public transport and carpooling services, simulating various uptake scenarios (e.g for Edinburgh from 20,000 to 80.000 rides

offered per day). This task enabled the evaluation of behavioural change by SocialCar users, stimulating co-modality and modal shifts (from private car to carpooling, together with increases in public transport usage). The on-site test used an estimation methodology - Technology Acceptance Model (TAM), developed by Davis et al. (1989) - for examining and quantifying the change in behaviour and new travel patterns by the deployment of in-depth analysis. This testing allowed project partners to estimate the potential quantitative impacts of system adoption in terms of car occupancy, congestion reduction, and CO_2 emissions. The promising results from this Test suggest that cities should foster adoption policies, as this multi-modal approach may bring relevant benefits to urban accessibility and environmental indicators.

- Test C) On-site real experiment: 4 selected sites (Canton Ticino, Edinburgh, Brussels, Ljubljana) implement real-life testing of the SocialCar system. These sites have selected a group of end-users (incl. carpoolers, corporate employees, students and other citizens) for a full SocialCar application test in real-life conditions.

From a technological standpoint, the testing phase, apart from validating the platform in terms of usability and functionality, gave relevant insights also useful for refining the business strategies, as well as governance models to be adopted by local authorities. These findings can be summarised as follows:

- In virtually all sites the availability of open data is not sufficiently developed: information relating to transport infrastructure and services is not complete, often inaccurate and sometimes even not disclosed by public entities, which severely hampers the development of new solutions by businesses and organisations with limited financial backing (e.g. entrepreneurial start-ups).
- De-facto standards for data provision and software architecture steer new projects to remain within established technical frameworks, to the advantage of global players in the ICT/ITS domain.

These factors coincide with a trend for strategic alliances between automotive and ICT global players, that are seeking to introduce new mobility services where commercial interests sometimes are in contrast to or outweigh the sustainable mobility efforts of public authorities.

4. Market roll-out

4.1. Technology acceptance potential

The results from the Technology Acceptance Model (TAM) survey completed by carpooling users, PT uses and car drivers (Test B), have been used to quantify the potential mobility behavioural change that could be achieved by the SocialCar service. The decision to use the TAM approach was based on the benefits of having standard and validated models for assessing users' attitudes and willingness to adopt new mobility habits, as well as to understand the use of travel assistance applications when opting for a certain mobility choice. Results from the questionnaires distributed at the ten project sites have shown good potential for SocialCar type services in most congested cities, and in particular within the younger age segment. In addition, an important factor is obviously the presence of existing carpooling services, which are capable of generating a critical mass of users in a relatively short time.

4.2. Business scenarios

The SocialCar project has been exploring four business scenarios, which allow early adopters across Europe to select whether a Business to Consumer scenario, or one of three Business to Business scenario variations, would provide the most appropriate approach for introducing SocialCar services and functions in their area.

4.2.1. Business to Consumer scenario

Under the Business to Consumer (B2C) scenario, SocialCar provides an intermodal route planning and carpooling service direct to consumers. The B2C model allows SocialCar to provide a complete service package of data processing, server operation, mobile app software marketing and customer care. The choice of whether the app is branded under the SocialCar banner or an alternative city or public transport operator banner is at the discretion of the commissioning organisation. This business scenario is expected to be most appropriate for those sites where there is limited choice or no quality multi-modal travel planning assistance services in the market, however, there is greater responsibility and risk associated with developing, financing and marketing the service.

4.2.2. Business to Business scenario

In the Business to Business (B2B) scenarios, SocialCar provides back office functionality such as data processing and provision, intermodal route planning, and carpooling software functions to another organisation or business. The three variations explored correspond with the nature of the possible commissioning organisation:

- B2B Independent Travel App – SocialCar provides a data gathering and harmonization function, for example, where the city authority aims to stimulate competition amongst private travel support assistance businesses. SocialCar is therefore deployed as part of an 'open data' strategy to ensure quality multi-modal data and route planning functions are available.
- B2B Transport Operator Module – SocialCar provides "back office" functions and software modules to an existing public transport operator, to enhance the capability of their existing travel support assistance service and app.
- B2B Transport Operator App – SocialCar provides a complete travel assistance service package of data processing, server operation and mobile app to an existing public transport provider.

Throughout the process, SocialCar plays an enabling role and remains invisible to the end-user who engages with the commissioning organisation's brand and consumer interface. Deploying one of the B2B scenarios is likely to be most suitable where there is already a good quality provider of app-based travel assistance services.

4.3. Business scenario and revenue options selection

Early discussions with the 10 sites on their preferences for which scenario to adopt in their city have been supplemented by SWOT analysis on the advantages and disadvantages of developing and launching the full app (as per the B2C scenario), versus integrating SocialCar functions with another service via use of an application programming interface (as per the B2B scenarios). 6 out of 10 sites have advised that the more comprehensive B2C business scenario is potentially most suited to their needs, in large part due to the absence of existing local partner providers of high quality travel mobile app services.

The B2C scenario is the most wide-ranging in terms of the service offer because it includes front and back office functions. However, this model is comparatively the most costly to introduce and therefore, the sites will need to ensure that both risk finance and app revenue streams are robust enough to support adoption of this approach. The potential options for generating revenue are diverse and include advertising, usage fees, subscription fees or in-app purchases. The selection of revenue streams should best reflect expectations on how potential revenue sources may affect local users' experience of the SocialCar app, and the willingness of local authorities to subsides the venture taking into account the positive impacts for mobility.

4.4. Setting up data and financial "clearing houses"

A stakeholder workshop carried out by SocialCar Site partners from Luxembourg resulted in some insights with regard to how data management and financial transactions could be managed. The proposed establishment of independent clearing houses as an integral component of the business scenarios and local organisational structure could offer the following benefits:

- Independent Data Clearing House – establishment of an independent data clearing house would enable all service providers to submit data, which would then be processed and made available through a unified API data stream. The "independent" status of the clearing house means that commercial organisations including PTOs, car sharing companies and taxi operators would be encouraged to submit data, within a framework of data privacy and security arrangements that would protect commercially sensitive information. This approach would also enable data to be published in a way that fosters competition in the travel assistance service app market. So, for example, the city authority could choose to develop a mobile app, but this would be based on the same data as that of a private sector competitor. This structure could also reassure different mobility providers that trip recommendations are not biased in any way.
- Financial Clearing House – the Financial Clearing House would offer similar reassurances of security and privacy, relating to both the commercially sensitive fare costing information of mobility providers, and the bank account details of customers. The approach of establishing a Financial Clearing House could enable end-to-end journey payments, without the need for separate mobility operators to separately request payment details and agree payment methods.

Both data and financial clearing houses demonstrate the concrete feasibility of a public-private model enabling competition and viable businesses while maintaining the public interests of good accessibility and related social

inclusion: all cities consider this model as relevant added value that is not assured in all-private initiatives often inclined to address the richest market segments, neglecting peripheral districts that offer less potential for profitable services.

4.5. Early adopters and business exploitation

In all 10 SocialCar test sites, the practical implementation of the theoretical business scenarios described above has gained traction. Back in 2015, SocialCar started with 2 carpool companies, the Belgian Taxistop and UK's Liftshare and 2 public transport authorities, the South East Scotland Transport Partnership and Brescia Mobilità, being directly involved as consortium partners. Today, the commercialisation efforts count 11 additional public transport companies and 16 private companies that are forging strategic alliances and business integration models, which are currently at different maturity levels (Fig. 3).

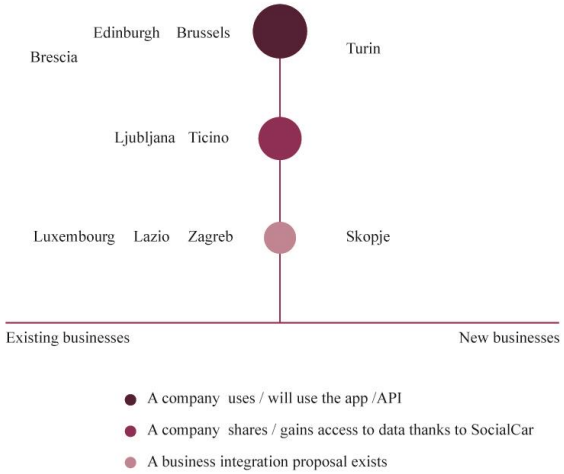

Fig. 3 Maturity of business exploitation

4.5.1 New businesses, reciprocal marketing and public incentives: Turin and Skopje

In September 2016, two taxis companies and the start-up MOVE PLUS signed a Memorandum of Understanding for the introduction of a new taxi-sharing service based on SocialCar. The taxi-sharing project seeks to complement the existing public service as taxies are part of the public transport offer of the city. The motives of the taxi companies to embark on taxi sharing are relating to the demand decrease in both the public and private sectors: the city administration alone cut the budget for taxi services by 80 %. As a consequence, the taxi-sharing service Wetaxi was launched in May 2017 in a trial phase. The marketing of the service seeks integration with a number of other commercial operations. In July 2017, Wetaxi started cooperation with the event organiser Movement srl. offering taxi sharing during the Kappa FuturFestival under special conditions. In cooperation with the Turin airport management company SAGAT, Wetaxi introduced a 50 % discount for passengers who wish to share a cab from and to the airport from 6 am to 10 am and from 16:00 to 20:00 pm. In August 2017, in cooperation with the Turin Tourist Agency, Wetaxi embarked on efforts to forge strategic alliances with hotels and congress organisers. The next integration step is to offer services for the network of museums and cultural points of interest located in the outskirts of the city, that have low public transport accessibility. Carpooling in Macedonia is developing more slowly when compared with other sites. There are just a few and most importantly user-driven initiatives such as a carpool website vozime.mk and several social media groups. The city of Skopje seeks a more systemized and business-oriented approach with both financial and administrative incentives, the latter implying city centre access in the winter months for SocialCar car passengers only. The current integration model in Skopje brings together the public transport operator JSP Skopje and other publically governed assets such as parking facilities and shared bikes, however, at present there is not a carpool company.

4.5.2 From public-private mobility integration to MaaS: Edinburgh and Brussels

With the South East Scotland Transport Partnership (SEStran) and the largest carpooling provider in the UK Liftshare, SocialCar in Edinburgh had already attained the maturity of public-private mobility integration in

2015. A local business integration taskforce also considered links to the running and cycling app Strava, the car clubs Enterprise, E-Car and Co-Wheels, as well as the MaaS alliance in Scotland.
SocialCar in Brussels brings together the carpooling provider TAXISTOP, the National Railway Company of Belgium SNCB, the Brussels Intercommunal Transport Company STIB, and the bus operators De Lijn and Tec that connect Brussels with Flanders and Wallonia. Both SNCB and STIB have been involved in test A. These companies consider SocialCar as a feeder to public transport for the first or last mile. The coverage of the Brussels test has, therefore, been expanded: in Test C, SocialCar is focussing on carpooling to train stations as the first mile solution. The local integration model foresees cooperation with the MaaS providers Olympus Mobility and Garage Swap that can upgrade their services with a multimodal route planner. Olympus Mobility is a B2B platform that brokers between different mobility services such as bike or car sharing, car park operators, public transport or electric vehicle charging stations. The company, furthermore, offers mobility packaging to other organisations that wish to provide their customers or employees with flexible mobility solutions, i.e. packages of different mobility services assembled in cooperation with independent mobility suppliers. Through SocialCar, Olympus Mobility seeks to integrate carpooling in their service and is particularly interested in the SocialCar open-source solutions to equip their packaging with multimodal route planning. Garage Swap is a partnership between energy providers, housing companies and mobility operators. Garage Swap draws attention to the opportunity cost of underground parking facilities, i.e. looking into what benefits a neighbourhood could have received if the investments in underground parking facilities were made elsewhere. Their mission is to "trade" the construction cost of underground parking facilities for local green energy production and alternative mobility services such as carpooling or car sharing. Through SocialCar, Garage Swap looks into offering a multimodal mobility app for people living in new residential buildings.

4.5.3 Unlocking data from carpool companies: Ljubljana and Canton Ticino

Ljubljana represents one of the most dynamic business integration cases. Since 2016, the Institute of Traffic and Transport Ljubljana - a SocialCar consortium member - has succeeded to attract a number of local mobility services including the public transport operator, the Slovenian railways, the bike sharing scheme BicikeLJ, the Park & Ride system in Ljubljana and most importantly the carpooling start-up Prevoz.org. Having attained a market roll-out maturity, the Ljubljana case study has been upgraded from desk to the on site real experiment. Prevoz.org will be sharing carpooling data for the test in an effort to explore the local market potential for integrated public-private mobility services. In Canton Ticino, SocialCar collaborates with public transport operators as well as with the carpooling companies Bepooler and MobAlt. The business model of Bepooler is based on local business integration: carpool trips are paid by petrol credits, which are redeemed for fuel at partner petrol stations. For the on-site real experiment, Bepooler has allowed access to its database of carpool trip offers while MobAlt shares details about shuttle buses. Being keen to expand their business models towards public transport integration, both companies are promoting this test among their customers, anticipating market potential evidence that will eventually determine the level of business integration upon completion.

4.5.4 Comprehensive integration models: Zagreb, Luxembourg and region Lazio

The integration efforts in Zagreb succeeded to bring together Zagreb Electric Tram, the Croatian Railways, the companies Citybike (bike sharing) and SpinCity (car sharing) as well as Radiotaxi Zagreb. The city of Zagreb as SocialCar consortium partner has also succeeded to secure the support from the Croatian Agency for SMEs, Innovations and Investments that declared its willingness to support SocialCar joint ventures. Furthermore, the Croatian Chamber of Economics, which currently collects data from all transport providers in Croatia, as well as the ticketing company Vollo (a one-stop shop for bus tickets), seek SocialCar software solutions.
Since September 2017, a taskforce composed of public and private stakeholders including the Luxembourg railways CFL and the Luxembourg Ministry of Sustainable Development and Infrastructure has been examining different SocialCar integration options. One of the proposals defines the role of a public authority responsible for the organisation of mobility in Luxembourg to act as platform owner of a one-stop shop for passengers including multimodal planning, booking and payment, and clearing house for the payments to the individual mobility providers. This proposal could materialise following plans of the Ministry of Sustainable Development and Infrastructure and CFL to launch a carpooling service in autumn 2017. In Lazio, mobility data integration has already been recognised as a business asset. The companies Moovit and URBI are integrating public and private mobility services, offering multimodal route planning. Despite these developments, the Lazio mobility market remains fragmented with an untapped integration potential, which could jeopardise both customers loyalty and market share of the local mobility companies in favour of global players. On 19 September 2016, Moovit was independently launched amidst SocialCar consultations in Lazio. The initial service was a route planner offering

carpool and public transport trips separately. In the spirit of SocialCar, this has been changed to combined public transport and carpool trips. Moovit, however, does not foresee further integration. On the contrary, its competitor URBI gathers data from a variety of mobility services including public transport, car sharing, scooter sharing and pooling, taxi, UberBlack, UberLUX and UberVan. Yet, solutions from all these services are offered separately. A much more advanced and demand-oriented level of integration is a combination of the range of services offered by URBI and the cross-modal planning as applied by Moovit. A SocialCar taskforce led Lazio Innova, the regional innovation agency, seeks to further advance the level of integration by means of the SocialCar technology.

4.5.5 Taxi as public transport substitute and integration with the touristic sector: Brescia

Particular interest in integration through SocialCar was shown by the tourism start-up DEG VOICE, Radiotaxibrixia, and FNM Autoservizi SpA, a rail transport company operating in Brescia province. DEG VOICE operates their own app for tourism attractions, and is contemplating the SocialCar software as a multimodal route planner to points of interest - a service they are currently missing. With a signed Memorandum of Understanding, Radiotaxibrixia offered to provide their taxi data for SocialCar integration in Brescia. One of the bottlenecks of the Brescia public transport system is the accessibility of the city centre at night. With a new app based on SocialCar, Brescia Mobilità seeks to compensate the missing links between the end of the public transport line and the city centre through taxi rides. In addition to the route planning service, passengers can use their public transport tickets for a discount on the taxi fares.

Work with the ten Sites to further define preferred business and deployment scenarios for SocialCar-type solutions is on-going at the time of writing.

5. Conclusions

The idea of local mobility service integration to counteract a global wave of market disruptions has resonated throughout Europe. A number of local businesses and public stakeholders have embraced the concept of SocialCar, including public transport operators, carpool providers, railway, taxi, ticketing, car park, airport management and car/bike sharing companies, MaaS stakeholders, incubators, chambers of commerce and commercial operations from other sectors, notably tourism, leisure and culture. In addition to the software engineering efforts, the project succeeded to unlock public and private data, engender business alliances and spin-offs, as well as one start-up within only 1 year of the commercialisation efforts. A particular added value is the fact that SocialCar reconciles often divergent interests. Taxi companies and alternative mobility entrepreneurs alike have recognised the strategic value of local data and business integration amidst growing pressure from global disruptive services. Local governments are keen to incentivise SocialCar-related operations because of the inherent triple bottom-line philosophy: while most of the disruptive services on the mobility market are led by commercial interests, SocialCar reduces congestion and environmental costs while supporting existing local mobility businesses and initiatives. 10 European sites exhibiting different initial maturity levels for SocialCar operations reveal that that the leap from early adoption to early majority is feasible in the short run. Yet, a crucial success factor remains the critical mass in supply and demand. UKs Liftshare counts 500,000 members and WeTaxi was able to gain traction because of the 700 taxi drivers who subscribed to the company's code of conduct.

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QUALITY OF TRANSPORT Special Eurobarometer 422 - 2014

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