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Enabling intermodal urban transport through complementary services: From Flexible Mobility Services to the Shared Use Mobility Agency
Workshop 4. Developing inter-modal transport systems

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ABSTRACT

This paper explores the potential contribution that the public transport Agency can make to the emerging Mobility as a Service (MaaS) paradigm through the integration of regular collective transport services with complementary flexible transport schemes and other forms of shared-use transport. The latest ICT developments provide new opportunities to organise and offer collective and individual mobility services. In the evolving scenario of the service sharing economy we see this with a number of new mobility schemes—e.g. vehicle sharing and dynamic ride sharing schemes like Car2Go, DriveNow, BlaBlaCar, Uber, Lyft. We define a Flexible and Shared Use Mobility (FSUM) Agency; a single co-ordination centre of different flexible services and shared mobility schemes, which requires co-ordination and co-operation among different service providers, the integration of data and platforms, technical services and systems. The fundamental enabling technologies and standards are illustrated and the supporting ICT architecture outlined. Finally, the organisational aspects related to the operation of the Agency are discussed and illustrated with reference to the EC-funded PERHT project.

1. Introduction

Collective transport services have long been seen as an important means for improving sustainable mobility in cities. Currently, over 74% of the EU-28 citizens live in urban areas, a proportion which is expected to exceed 80% by 2030 (EEA, 2013). In 2013, total passenger transport activities in the EU-28 by any motorized means of transport were estimated to amount to 6465 billion pkm or on average around 12,700 km per person (EC, 2015). Currently, the transport sector is responsible for around 23% of total CO_2 emissions in Europe and if this trend continues, transport is expected to contribute up to 50% of CO_2 emissions by 2050 (EU, 2012). For over two decades increasing efforts have been undertaken to improve local mobility and reduce the negative impacts of traffic in cities and towns across the Europe. A significant number of projects implemented under the European Commission's CiViTAS and other transport-related programmes (including e.g. IEE, FP7 R&D ICT and Transport framework, Regional Co-operation, etc.) have produced important outcomes ranging from concept exploration to pilot implementation and demonstration (Korver et al., 2012).

However, as stressed by the European Commission in a series of communications (EC, 2009; EC, 2011; EC, 2013), new challenges continue to emerge. Among these, climate change, energy consumption, air quality, the difficulties of tackling congestion and accessibility, especially for disadvantaged citizens, are of paramount importance. For these reasons, the priority objective is now to enhance mobility and accessibility while, at the same time, reducing congestion, road accidents and pollution in cities.

In this paper it is contended that such a complex set of problems can only be effectively tackled by adopting an integrated, multimodal and robust set of measures. More sustainable urban mobility, for people and goods, and significant benefits in terms of energy consumption, environmental impacts and quality of the urban environment requires an appropriate mix of interrelated policies

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and measures. These include: integration between housing policies and transport planning (generally indicated as Transport Oriented Development-TOD); enhancement of public transport efficiency and equity (based on, e.g. more extended and frequent public transport, bus rapid corridors, flexible mobility schemes and feeder services, etc.); promotion of green modes (including pedestrians and bikes) and of "clean" vehicles.

This paper will address the enabling role of technology in encouraging intermodality in urban transport through integration of regular collective transport services with complementary flexible transport schemes and shared-use transport, both public and private.

2. Towards a new understanding of shared transport solutions

It is widely accepted that sustainable urban mobility is unlikely to be achieved without the provision of efficient, extensive and accessible collective transport options (see for example, White, 2017). In the 2011 White Paper (EC, 2011), the European Commission stressed the key role of the public transport sector as a crucial factor for tackling congestion and deteriorating living conditions in urban areas. Considering that bus services are the primary form of public transport both in Europe and globally[1] it is evident that the adoption of any effective mobility solution must include this key component. Furthermore, 2014 saw the highest number of local public transport journeys in the EU-28 Member States since the turn of the millennium although this masks significant national variations which are linked with national employment figures (UITP, 2016).

It is well documented that over the past fifty years the operating conditions for conventional bus services have deteriorated. A major challenge is to break the so-called vicious circle whereby increasing motorisation contributes to deteriorating public transport service quality and the further increase of private car use. This is important not only to improve urban mobility, but also to enhance overall city liveability, to reduce pollution and emissions and to promote social inclusion (Banister, 2005). Practical experience (e.g., Korver et al., 2012) has shown that urban areas require robust and efficient mobility solutions which are well integrated in the overall urban planning system and suitable to specific city characteristics. Innovative measures to increase the quality of bus services and strengthen the efficiency of newly emerging mobility schemes are required.

Over the last fifteen years with the support of European funding[2] several flexible and demand responsive transport services applications have shown important advantages and benefits in several European cities (Mulley and Nelson, 2016a; Nelson, Wright, Masson, Ambrosino, & Naniopoulos, 2010). Demand Responsive Transport (DRT) services are complementary to the conventional, scheduled passenger transport (fixed lines and timetable), as they usually address dispersed mobility needs, both during hours of low demand and in areas of low population or where target users are dispersed amongst the general population, e.g. disabled and elderly, tourists.

Flexible Transport Services (FTS) can be defined more widely as a transport service which is adapted for meeting users needs, typically on a trip-by-trip basis with a certain level of flexibility on three operational dimensions (routing, timing of the service, vehicle used) in order to enhance service offer and minimize costs in response to demand. FTS include a larger range of services and schemes, such as: general use and feeder services, local and feeder services to trunk haul services, replacement of low-frequency conventional services, replacement of fixed routes in evenings, weekends and other low-demand periods, dedicated/special services restricted to specific users groups, services in low-density rural areas, services designed for efficiencies in social mobility resources, niche urban markets, etc. These different operational schemes have been validated and evaluated from their feasibility and technology aspects to the organization and business models, with different levels of implementation and results (Nelson et al., 2010). At a policy level the EC 2007 Green Paper (EC, 2007), recognises that customized (Public Transport) solutions could better serve suburban areas and enhance integration and accessibility and calls for the implementation of Sustainable Urban Transport Plans (SUTPs) as part of Sustainable Urban Mobility Plans (SUMPs).

From the operational point of view, FTS are organized around the concept of a TDC (Travel Dispatch Centre), as the key operational (and technological) resource supporting the management of the main operation steps connected to the service production workflow: the TDC manages users booking requests, journey planning and resource optimization (vehicles and drivers) communicating to the driver the new journey or the variations to the already planned one.

Complementary to these trends, the traditional contrast between collective and individual transport solutions is gradually blurring. In a service-sharing economy where the concept of *Mobility as a Service* (MaaS) is becoming a concrete market option, new alternatives to public supplied schemes and car ownership are emerging alongside established schemes like collective taxi and demand responsive bus services, bike and car sharing. Dynamic car-sharing schemes (such as Car2Go, DriveNow and Zipcar), dynamic ridesharing services (like BlaBlaCar and Flinc), peer-to-peer transport arrangement schemes (such as Uber, UberPop and Lyft), and brand new forms of "institutionalized hitchhiking" (i.e. RezoPouce) are all examples of this new offer of flexible mobility schemes, complementary to regular (fixed routes and timetable) as well as flexible collective/public transport (Nelson & Wright, 2016). Of particular relevance is the following significant trend: *from merely being the final recipients of transport services*, *users themselves have gradually become*, *in recent years*, *potential mobility service providers*.

The emerging term for collective transport services based around the use of private cars is new mobility services (NMS). Kent and Dowling (2016) provide a useful typology for "cars on demand" which they define as a form of transit involving collaborative use of the car which is characterised as largely based around ride/lift-sharing and car sharing/car clubs. They draw a distinction between services which are primarily peer-to-peer operation (liftsharing examples include CarMa, 'Slugging'; car sharing examples include GetAround, Car Next Door, Relay Rides) and those which are primarily commercial operation (liftsharing examples include Uber, Lyft; car sharing examples include Zip Car, GoGet, Zoom). In considering this development Mulley and Nelson (2016b) suggest that it is useful to reflect on whether we are potentially seeing a redefinition of public/collective transport systems and the extent to which NMS may be incorporated within the traditional public transport offer.

The European Commission (EC, 2016) notes that a paradigm change in transportation is expected to take place through the emergence of Mobility as a Service (MaaS), where the service providers could offer travellers easy, flexible, reliable, price-worthy and environmentally sustainable everyday travel, including for

[1] Of the 57.9 billion public transport journeys made in 2014, 55.8% were by bus, 16.1% by metro, 14.5% by tram and 13.6% by suburban rail (UITP, 2016).

[2] European Research Framework Programme IV, V, VI projects (e.g. SAMPO, SAMPLUS, VIRGIL, SIPTS, INVETE, FAMS, CONNECT) and in the Inter-regional Co-operation Programme 2000–2006 projects (e.g. MEROPE and AGATA under INTERREG IIIB MEDOCC, SUNRISE and MASCARA under INTERREG IIIC Programmes).

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