COLLABORATIVE MOBILITY: COMMON FEATURES IN A NEW GENERATION OF MOBILITY BUSINESS MODELS

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ABSTRACT

Mobility has been massively disrupted by new-generation telecoms and mobile apps, which allow an optimised utilisation of both transport means and infrastructures. When it comes to this kind of mobility, transport authorities and 'traditional' transport planning can only do little. Citizens step in and fill in the gaps at neighbourhood level by co-creating mobility solutions, as they already own or have at their disposal enough assets to work with: private and commercial vehicles, tracking and geo-location capabilities, smart communication devices, a transportation infrastructure grid and so on.

Without additional investment in physical assets for marginal uses of the infrastructure, and without adding more vehicles to the streets, it becomes possible to 'kick start' a new mobility 'metabolism' through collaborative solutions that concatenate several 'sharing' approaches: car-pooling, car-sharing, crowd-parking, bike-sharing, cargo-pooling, data-sharing.

In sum, crowd-sourcing and shared-economy ideas are turbo-charged by new technologies. Such technologies can bridge social capital and citizen power with the valuable aspects of free market economics. In addition, crowd-sourcing mobility solutions seem to make economic sense and bring democratic thinking and environmental conscience. But are they financially sustainable?

1. A NEW MOBILITY PARADIGM?

The idea of sharing things and using them together has worked perfectly well for hundreds of years. In fact, sharing economy ancestors are not Uber or Airbnb. Yet sharing behaviour is being revolutionised and facilitated nowadays by an easy and widespread access to digital information and communication technologies (Papí, 2016).

As a consequence, the shared economy is in the process of evolving into a significant element of the economic cycle -if it is not already-. The idea of sharing things and using them together has worked perfectly well for hundreds of years. All of a sudden, however, it has begun to spawn disruptive business models with spiralling customer numbers and revenues to match (Uber, Airbnb, BlaBlaCar, Deliveroo, etc.)

'Traditional' logistics require centralised planning and thinking; much research has been performed on learning from ant colony and beehive analysis in order to create learning systems. Yet there is a limit on how much we can learn from ants and bees. It is better to design systems to help people interact in better and smarter manner (Papí, 2018). This is the philosophy behind crowd-sourced mobility.

Shared (or collaborative) mobility is arguably the most rapidly growing and evolving sector of the sharing economy. When it comes to this kind of mobility, transport authorities and 'traditional' transport planning can do only little. Citizens step in and fill in gaps where mobility demand is inefficiently met at neighbourhood (or any other) level by co-creating mobility solutions. For example, focus group studies carried out by the ITF show that citizens in Finland's capital Helsinki are specifically looking for services that connect different outer areas of the city with each other (ITF, 2017). In the Irish capital, Dublin, shared services could be useful as feeder services to public transport for residents in suburban areas (ITF, 2018). (Papí, 2016). In this regard, citizens already own enough assets to work with: private and commercial vehicles, tracking and geo-location capabilities, smart communication devices, a transportation infrastructure grid at their disposal, and so on.

Without additional investment in physical assets (obviously in the case of marginal uses of the existing infrastructure, as a widespread commercial roll-out of new solutions would require additional infrastructural investments), and without adding more vehicles to the streets, it seems possible to 'kick start' a new mobility 'metabolism' through sharing and collaborative solutions. These solutions allow changing urban metabolism by concatenating several 'sharing' approaches: car-pooling, car-sharing (car-pooling and car-sharing are often referred indistinctly as 'ride-sharing'), crowd-parking, bike-sharing, cargo-pooling (such as the one proposed by the DynaHUBs project https://www.dynahubs.com) and data-sharing (Such as the traffic data shared by Waze users www.waze.com).

Mobility has been massively disrupted (in a positive manner) by new-generation telecoms and mobile apps, which today are allowing an optimised utilisation of both transport means – public and private – and infrastructures (Papí, 2016). Young professionals living in cities increasingly invest in smartphones to hail a ride rather than in their own set of wheels.

For instance, the International Transport Forum (ITF) has recently stated that both passenger and freight transport demand is set to nearly triple in the next three decades, at the same time highlighting that potential disruptions from within and without could significantly change

the transport sector (ITF, 2019). In particular the ITF has examined several disruption scenarios and concluded that:

- A massive uptake of shared mobility could halve vehicle-kilometres travelled in cities and reduce urban transport CO2 by 30% by 2050;
- The combination of shared mobility services, autonomous vehicles, and restrictions on private cars could cut urban transport CO2 by 73%.

Crowd-sourcing and shared-economy ideas are obviously turbo-charged by new technologies. With the proper solutions, such technologies can provide for the European way of bridging social capital and citizen power with the valuable aspects of free market economics. Crowd-sourcing mobility solutions seem to have economic sense and bring democratic thinking and environmental conscience. But are they financially sustainable? (Papí, 2016).

2. LET'S START BY THE BASICS: WHAT DO WE UNDERSTAND AS SHARING ECONOMY?

In 2015 the term 'sharing economy' was introduced into the Oxford English Dictionary. But it seems there is a growing confusion of what the sharing economy actually means. In this context, terms like 'sharing economy', 'peer economy', 'collaborative economy', 'on-demand economy', 'collaborative consumption' are often used interchangeably, though they mean very diverse things.

Today many terms are being used to describe a broad band of start-ups and models that in some way use digital technologies to directly match service and goods providers with customers, bypassing traditional middlemen. The following categorisation (Botsman, 2015) provides much-useful to-the-point definitions:

- Collaborative Economy: An economic system of decentralised networks and marketplaces that unlocks the value of underused assets by matching needs and haves, in ways that bypass traditional middlemen.
- Sharing Economy: An economic system based on sharing underused assets or services, for free or for a fee, directly from individuals.
- Collaborative Consumption: The reinvention of traditional market behaviours — renting, lending, swapping, sharing, bartering, gifting— through technology, taking place in ways and on a scale not possible before the Internet.
- On-Demand Services: Platforms that directly match customer needs with providers to immediately deliver goods and services.

In addition, it is important to highlight the existence of two collaborative economies: one for profit - ridesharing, private accommodation, collaborative food markets, etc. -, which can be considered as an alternative to traditional business models, and one non-for-profit related to barter-like sharing and exchange of goods - home swapping, clothes swapping, services exchange, etc. (Beaumont, 2016).

Another categorisation suggests four categories of activities in the collaborative economy: i) recirculation of goods, ii) increased utilization of durable assets, iii) exchange of services, and iv) sharing of productive assets (Gruszka, 2016; Schor, 2014).

There are authors (Beaumont, 2016) that also connect the rise of the collaborative economy with the economic crisis and the widespread utilization of smartphone applications across the population. Likewise, many of the new sharing and collaborative consumption organisations benefitted from the 2008 economic collapse, which "caused some consumers to lose their homes, cars, and investments and made most everyone more price sensitive" (Belk, 2014).

From a Marxist perspective, collaborative consumption could be viewed as an economic resistance to global capitalism that has born out of its inherent contradictions, signalling a dialectic relationship between capitalism and the sharing economy, which is seen to be more democratic (Rifkin, 2014). Along this line of thought, we could label collaborative consumption as "a form of resistance", a countermovement to the economic violence of the free-market, aimed at self-protection by using the Internet in order to create or engage in alternative to free market-exchange models allowing access to a greater diversity of goods at lower prices (Viba, 2014).

Collaborative consumption can also be labelled as a shift "from a world where we're organised around ownership to one organised around access to assets" (Gansky, 2014). In a way, "the so-called 'sharing economy' has turned traditionally underused assets into competitors to established industries" (Beckmann, 2013). This shift in consumer values from ownership to access is fundamental to understand the on-going emergence of a global network for entrepreneurs, businesses and governments which holds the potential to transform business, consumerism and the way we live.

We can also distinguish between three different constituents in the collaborative economy ecosystem (Sundararajan, 2014):

- Platforms (marketplaces),
- Entrepreneurs (small businesses, micro-entrepreneurs), and
- Consumers.

While the platforms are the person-to-person marketplaces that facilitate the exchange of goods and services between peers, entrepreneurs are the individuals or small businesses that supply goods and services in these marketplaces. In this context, consumers are the individuals who drive demand: buy, rent, consume (both entrepreneurs and consumers are often referred to as 'peers'). To close the circle, typically the payment from the consumer to the entrepreneur is mediated by the platform, which often charges a commission to one or the other trading party.

From another perspective, we could note five key ingredients to truly collaborative, sharing-driven companies (Botsman, 2015):

- The core business idea involves unlocking the value of unused or under-utilized assets ('idling capacity') whether it is for monetary or non-monetary benefits.
- The company should have a clear values-driven mission and be built on meaningful principles including transparency, humanness, and authenticity that inform short and long-term strategic decisions.
- The providers on the supply-side should be valued, respected, and empowered and the companies committed to making the lives of these providers economically and socially better.
- The customers on the demand side of the platforms should benefit from the ability to get goods and services in more efficient ways that mean they pay for access instead of ownership.
- The business should be built on distributed marketplaces or decentralised networks that create a sense of belonging, collective accountability and mutual benefit through the community they build.

Now the issue is to review how the new economic paradigm briefly reviewed above has made its way to mobility and transportation.

3. A DEEPER LOOK INTO COLLABORATIVE MOBILITY

Sharing routine objects seems to make social and economic sense. Such economic sense becomes immediately apparent in the case of automobiles, which are simply left standing instead of being driven for most of the time (Beckmann, 2013).

In recent years, the success story of car-pooling and car-sharing platforms such as BlaBlacar, together with the expansion of transportation network companies (TNC; the TNC acronym designates companies providing transportation services that resort to online platforms (website or mobile apps) to connect passengers with drivers using their personal vehicles. They are also called PHV (Private Hire Vehicles) in the UK. Well-known examples include Uber and Lyft) such as Uber, has marked the onset of a new mode of transport that we could label as 'collaborative transport'.

Beyond the classical motorised individual transport and collective public transport by rail or road, this new transportation option is moving beyond the status of a simple niche demand. A non-exhaustive glance at successful collaborative mobility solutions at the global level brings up platforms as the following:

Uber (www.uber.com) was launched in 2009 as a luxury service providing drivers in black cars to people who needed a ride (https://growthhackers.com/growth-studies/uber. Retrieved on 8 May 2019). A TNC platform, requests and payments are made through the mobile app, and reviews allow building trust between users. Uber is estimated to have 110 million worldwide users (https://www.statista.com/statistics/833743/us-users-ride-sharing-services. Retrieved on 8 May 2019) and has operations in 750+ metropolitan areas worldwide (https://www.uber.com/en-BE/cities. Retrieved on 8 May 2019). Many different services are now available under different brands, including economic options (UberX, Uber XL, UberSelect), premium cars (UberBlack, UberSUV, UberLux), electric cars (Uber Green) and delivery services (UberRush, UberEats). Some Uber services are provided by professional drivers with a TNC licence, while others are provided by peers.

Lyft (www.lyft.com) is a transportation network company (TNC) operating in 600+ cities in the United States and 9 cities in Canada (https://www.lyft.com/driver/cities. Retrieved on 8 May 2019). It develops, markets, and operates the Lyft mobile app, offering car rides, scooters, and a bicycle-sharing system.

Waze (www.waze.com) is an app for smartphones that enables step-by-step navigation and real-time traffic information (RTTI). Traffic information is based on crowd-sourced data regrouping movement data of Waze users (100+ million worldwide) in certain areas as well as their manually supplied additional data such as traffic density, road construction works, or police/radar controls. By utilising this data, Waze detects congestions on the route and suggests alternatives. Waze users can also register themselves as map editors to add missing information and rectify altered design and layout of roads. Additionally, Waze provides traffic data to public entities and broadcasters.

Moovit (www.company.moovit.com) provides an app for smartphones that intends to improve the use of public transportation. Currently it is present in 2,700+ cities in 90 countries and counts on 400+ million users. Users can plan their travel with public transportation and other selected mobility services. Similar to Waze, Moovit relies on crowd-sourced data to add real-time information about delays, cancellations, and other characteristics of individual trains or buses, e.g. crowdedness or cleanliness. Moovit also enables users to register as editors in order to alter or add lines, routes, and timetables.

BlaBlaCar (www.blablacar.com) is an online marketplace for carpooling. Its website and mobile apps connect drivers and passengers willing to travel together between cities and share the cost of the journey. The platform has 70 million users in 2019 and is available in 22 countries (https://thenextweb.com/adobe-fundamentals/2019/02/19/why-french-unicorn-blablacar-still-believes-in-done-is-better-than-perfect/. Retrieved on 7 May 2019).

Zipcar (www.zipcar.com) is the world's leading car-sharing network operating in over 500 cities and towns. Zipcar provides over one million members on-demand access to more than 12,000 vehicles in urban areas and college campuses (https://www.zipcar.com/press/overview. Retrieved on 7 May 2019).

The World Collaborative Mobility Congress (Organised annually by Wocomoco Mobility Academy, a subsidiary of the Touring Club of Switzerland. Flyer downloadable from https://www.wocomoco.org/assets/docs/Publikationen/WOCOMOCO-Brand-Flyer-2014v6_engl-version-webseite.pdf. Retrieved on 22 March 2019) highlighted that "collaborative mobility focuses on sharing journeys, modes of transport and infrastructure. In between collective and individual transport new peer-to-peer based networks are emerging, boosting new types of individual mobility beyond private car-ownership. We are increasingly freeing ourselves from the costly constraints of having to purchase and possess our means of transportation and at the same time are making us independent of large-scale public transport providers to serve our mobility needs. Private bicycle and car sharers, carpooling services, long-distance bus service providers and shared parking providers are as much a part of this new mobility paradigm as the numerous websites and apps where new mobility products and services can be purchased, rented or shared – ranging from cars to public transport tickets to cargo bikes".

A high-level review of the collaborative mobility alternatives listed above (car-pooling, car-sharing, crowd-parking, bike-sharing, plus two additional alternatives suggested by the authors, cargo-pooling and data-sharing) reveals several common features:

- Use is favoured over private ownership (for instance, co-mobility apps launched by cars manufacturers).
- Sharing is often a strategy for investment optimisation (i.e. overhead costs of maintenance minimised in shared fleets).
- Moving is privileged over standing still (i.e. sharing parking reduces costs for parking owners, and at the same time decreases the external costs caused by 'parking search' traffic).
- Pay-per-use is favoured over long-term investment (i.e. the costs of private ownership of a vehicle are passed onto others while the user still enjoys the benefits he sees in possessing a private car).
- Networking and socialisation are preferred over individual ownership (i.e. ride-sharing as a smart form of hitch-hiking and meeting other people).

- A citizen-driven, ‘uncontrolled’ mobility confronting politicians with new challenges (i.e. car-poolers increasing traffic volumes).

Research (Project Consortium TUM Living Lab Connected Mobility, 2016) shows that the attractiveness of the mobility ecosystem depends on a balanced participation (and integration) of service users and services provided. In such a mobility ecosystem, end-users are not only data evaluators as participants but also data sources, as they may contribute to the ecosystem by providing own traveling data and views regarding their mobility preferences. In this context, crowdsourcing in the mobility context often involves:

- Navigation applications, providing the fastest, shortest or nicest driving route from point A to B, or the route with least emissions, to name just a few.
- Intermodal traffic recommendation applications, offering all possible routes from point A to point B providing combinations of different mobility services, such as public transportation, bike sharing or car sharing
- Mobility sharing applications, enabling two or more users to share a ride from point A to B.
- Mapping applications, offering indoor and outdoor maps for special purposes and based on crowd-sourced data.

The availability of Peer-to-Peer (P2P) networks connecting collective and individual transport open new doors, as they apparently free the citizen from the (previously almost-compulsory) private purchase of a mobility tool. In this sense, P2P networks allow people to avoid buying a vehicle of their own and instead hiring a car when they need one; as a consequence, “their mobility is guaranteed without the financial burden of private car ownership” (Beckmann, 2013).

Some authors highlight that collaborative transport benefits from idle, unused transport capacity, therefore offering a low-cost and environmentally friendly mobility with little capital investment in the case of marginal uses of the infrastructure. Taking the example of car-sharing, the potential environmental advantages operate through two channels (Firnkorn and Shaheen, 2015). First, fewer cars have to be produced to satisfy the same overall demand for auto-mobility. Second, with car sharing people use cars more selectively because the marginal costs loom larger than when they own their car (and the fixed costs thus dominate the marginal costs). Along this line, the use of electric or hybrid vehicles in car sharing schemes could have a multiplier effect in terms of these environmental benefits.

This school of thought makes collaborative mobility equivalent to sustainable mobility, highlighting that “it is economically sustainable because it makes better use of existing capacities and requires no additional investments in infrastructures. It is ecologically sustainable because, by making better use of existing capacities, it spares finite resources;

then again, it is socially sustainable because it promotes new forms of communal mobility organisation" (Beckmann, 2013).

To the contrary, other authors challenge the above, as they are indications that shared mobility may not only replace some forms of private travel but may also facilitate other forms of private travel; hence, the net environmental and transport impacts remain contentious (Franckx, 2015).

The authors are of the opinion that the impact of shared mobility on traditional forms of transport has not been studied sufficiently. According to the ITF (ITF, 2019), "bike-sharing and micromobility-sharing may lead to a switch from certain short-distance car trips in some contexts, especially where car use dominates". The IFT further reflects that, in the case of high-quality and cost-effective public transport being available, preliminary findings show that bike-sharing and micromobility-sharing can serve as feeders to public transport, but often replacing walking, while where public transport is infrequent or of low quality, these modes may substitute for public transport.

Today scholars and public policy makers increasingly promote the sustainable mobility paradigm (Banister, 2008) based on 'optimal congestion' and not on 'minimal congestion' (Urry and Lyons, 2005). This is to be achieved through four key objectives: fewer trips, modal shift, distance reduction, and increased efficiency (Cohen, Kietzmann, 2014).

Fewer trips are associated with a reduction in total trips required or taken by a citizen which can be achieved through solutions such as the ability to make online purchases for locally and regionally produced goods and services. Modal shift is the idea of altering the transportation hierarchy from single occupancy vehicles to walking, public, and shared transit alternatives. Through increased densities and better mixed-use development, cities can achieve a reduction in aggregate distances travelled by residents. Finally, increased transport efficiency is associated with reduced environmental impacts of the transportation system through more energy efficient public transportation services and the encouragement of lower footprint personal vehicles (Banister, 2008).

4. COLLABORATIVE MOBILITY: A CHALLENGE TO TRADITIONAL TRANSPORT PLANNING?

Transportation planning is commonly defined as a collaborative process that defines future policies, goals and investments for the mobility of goods and persons in a given territory. Generally speaking, transportation-planning practitioners apply a multi-modal and/or comprehensive approach incorporating the input of public and private stakeholders assessing a range of alternatives and forecasting impacts on the transportation system as a whole.

The second half of the twentieth century saw an increasing sophistication in the methods and techniques associated with transport planning. Increased computer modelling capability, better information technology and improved educational standards all drove up the quality of inputs to planning processes.

Yet we could claim that little change has taken place in the basic transport planning models over the last four decades with the four-stage aggregate model (trip generation, trip distribution, modal split, trip assignment) acting as the bedrock upon transport planning takes place. Since the 1960s transport planners have developed a strong tradition of scientific method for solving urban transport problems, using the classic deductive approach: data collection, defining goals and objectives, and forecasting future demands (Banister, 2002).

Methods and techniques used have been increasingly called in to question in terms of how well they were able to predict long-term futures and help inform policy-making processes (see Timms, 2008 and Næss and Strand, 2012 for lively critiques). Many were associated with practices of ‘predict and provide’ whereby travel demands were predicted using ever more sophisticated models that were then provided for through increased supply (Owens, 1995).

Where mature transport networks exist, the idea of ‘predict and provide’ has been increasingly questioned. Significantly it took no account of the aims of other policy sectors, this at a time when policy integration and sustainability have increasingly become recognised as an important governmental challenge (Te Brommelstreot and Bertolini, 2010). For instance, drawing upon an analysis of 210 projects across 14 countries, Flyvbjerg et al. found that ‘‘forecasters generally do a poor job of estimating the demand for transportation infrastructure projects” (Flyvbjerg et al., 2006: 1).

It therefore seems that current transport demand forecasting and strategic policy-making tools are not sufficient for the change and uncertainty we currently face in the 21st century (Walker et al., 2010, Lyons, Davidson, 2016). On the one hand, physical mobility systems appear ever more crucial in granting individuals and organizations access to the spatially and temporally disjointed resources they need to thrive, or even just to survive. On the other hand, because of a heterogeneous mix of mounting financial and fiscal constraints on infrastructure expansion, and growing awareness of and social resistance to the negative impacts of mobility, the traditional `predict and provide' approach to planning is no longer an option (Bertolini, 2007).

In this context, we could be witnessing an evolution from a rigid transportation ‘monoculture’ that forces people to adapt to the system rather than a flexible, responsive and user-friendly transportation ‘poly-culture’ that can adapt more easily to people and their activities. By transportation monoculture, we refer to inelastic and inflexible systems where there are few mobility options and people must adapt their activities based on the limited

mobility options available. In contrast, a transportation polyculture refers to a more robust and flexible transportation system with a wide range of mobility options, involving a wider spectrum of mobility technologies, and in addition requiring a much greater degree of coordination among modes and travellers. In such context, the public sector would have a multifaceted role – not only as a regulator of private transportation and a provider of public transportation, but also a facilitator of shared transportation (Miller, 2011).

Two avenues are of interest here (Vigar, 2017). First, there is increasing recognition in academic circles that disciplinary boundaries often perpetuate approaches not suited to contemporary, complex problems. Inter-disciplinary work is thus often proposed to bring together experts from different disciplines to provide new perspectives. It reflects the idea that innovation frequently arises from interactions outside the immediate policy community. Second, there is increasing attention to involving 'non-experts' in such practices, to generate information and 'co-produce' solutions. These two elements can be brought together in a 'trans-disciplinary' approach, which encompasses experts from across disciplines but also non-experts (Hirsch Hadorn et al., 2008).

The contentious nature of much transport planning in an era of greater citizen activism and less trust in experts also suggest that planning is unlikely to succeed if conducted in a top-down, autocratic way (Vigar, 2017).

In a context where there are opportunities for collecting user preferences at the convergence of three technologies - sensor technologies, geographic information systems, social computing -, collaborative mobility allows participants sharing information and resources, collaborating on solving local and operational transportation challenges ("How do I get to work today?"), and in addition making joint decisions that take the total system costs into considerations (Miller, 2011).

Greater user involvement improves the flow of information, of situated knowledge, to a strategy. And one way of overcoming implementation deficits is by giving people ownership of strategies through participation. The collaborative platforms that 'match' services and clients have huge amounts of data available - for instance on accidents, driving patterns, real-time trip data, driver availability. If these data were shared with transportation authorities, this could lead to improvements in the transportation network and the identification of areas that are poorly served by transport services (Franckx, 2015).

Yet at present comparatively little attention is paid to this bottom-up, cooperative approach to transport planning with rather more attention devoted to adjusting demand models for example (Vigar 2017).

The above clearly points out to a principal challenge for transport planners in the years to come: figuring out how to take advantage of the choices of individual transport users in the practice of transport planning and policy development.

5. NEW BUSINESS MODELS FOR THE SHARING ECONOMY

The business model is a broadly discussed concept in academia and practice. It represents a company's money-earning logic (Osterwalder & Pigneur, 2010). Within the architecture of the company, a business model is located between the strategic and operational layer (e.g. Osterwalder, 2004). The meaning of business models underwent strong changes; from a technological to an organisational, and then to a strategic approach (Wirtz, 2011). Still, literature does not agree upon one single understanding.

As noted by Abdelkafi and Makhotin (2013) there are two major streams: an activity-based and a value-based stream. The *activity-based view* describes the business model as the way activities and resources are used to do the business and achieve growth (Baden-Fuller & Morgan, 2010). The *value-based view* defines the business model as a "representation of how a business creates and delivers value, both for the customer and the company" (Johnson, 2010), or as "the way organizations or individuals communicate, create, deliver, and capture value out of a value proposition" (Abdelkafi, 2012).

Staying on the latter perspective, a business model can be defined as a concept describing what value a company proposes to existing and potential customers (*value proposition*), how the business is organized to create the value (*value creation*), with which resources and infrastructure (*value creation infrastructure*), under which circumstances (*value creation conditions*), and how financial value is retained for the company (*value capture*; e.g. Mäkinen & Seppänen, 2007; Johnson, 2010; Osterwalder & Pigneur, 2010; Osterwalder, Pigneur, & Tucci, 2005; Teece, 2010; Zott et al., 2011).

In this sense, a business model defines the product a company provides and the way it interacts with customers and suppliers (Ovans, 2015). It relies on few founding pillars: a superior *value proposition*, a *profit formula* that outlines how to convert value into revenue and the *key resources and processes* to deliver the proposition (Johnson, Christensen, & Kagermann, 2008). These key resources are among others brand, people, technology, partnerships and data (Seiberth & Gruendinger, 2018).

Information technology offers extensive strategic and economic possibilities and decision makers have to consider new technological solutions that re-shape existing business models (Beutel et al, 2014; Teece, 2010). New business model concepts are being explored these days, motivated by the need to describe and analyse new forms of business, such as e-businesses or virtual organizations (Mahadevan, 2000; Timmers, 1998). For instance, today

seven in ten of the world's most valuable brands are digital platforms (Seiberth & Gruendinger, 2018).

'E-business' refers to the application of information and communication technologies (ICT) in support of business activities (Beynon-Davies, 2012). The advent of the ICT has caused organisational transformations incorporations and industries (Timmers, 1998; Tapscott et al., 2000; Dubosson-Torbay et al., 2002; Martinez, 2000); in a way, we could say that the concept of a 'business model' has become almost synonymous with e-business and the emergence of the new economy.

Researchers have further created the concept of 'platform business models' to refer to transactions occurring in a two-sided market (Rochet and Tirole, 2003b, 2006) in which various stakeholders can join the platform as part of the supply or demand side (Rochet and Tirole, 2003b; Rochet and Tirole, 2006; Armstrong and Wright, 2007; Evans and Schmalensee, 2008; Rysman, 2009). A two-sided market is an environment established to allow multiple groups such as suppliers and consumers to participate in order to exchange the values that each group desires to obtain through fair 'transactions'. The 'network effect' emerges from these 'transactions' because transactions in two-sided markets create value by facilitating interactions between the different sides (Parker and Van Alstyne, 2005, Eisenmann et al., 2006).

Platforms evolve through the connection and interaction of platform participants as an ecosystem of coexistence that can provide new values and benefits to all participants (Ceccagnoli et al., 2011). And it is at the heart of a business ecosystem that consists of mutually-dependent business communities, producers and consumers, all of which have a complementary and symbiotic relationship with the platform (Evans et al., 2006). Therefore, the nature of platform business models can be characterised by three keywords: 'two-sided market', 'network effect', and 'business ecosystem' (Junic, 2015).

A specific category of platform business models are the ones operating in "sharing economies" of collaborative consumption (Botsman & Rogers, 2010), where people offer and share underutilized resources in creative, new ways. For instance, Airbnb lets people rent out part or all of their homes for short stays, and Uber allows for real-time, location-based ride-sharing. As a consequence, an increasing number of individuals who may not have considered ridesharing or renting a room in private residence as their vacation domicile a few years ago now prefer such sharing models to mainstream alternatives.

Some scholars, however, believe that the 'classical' activity-based and the value-based views presented above do not factor in the resulting complexities when companies deliberately aim for ecological and social value creation beyond financial profits (Schaltegger et al, 2016) and they are therefore increasingly exploring if and how modified and completely new business models can help achieve economic prosperity by either

radically reducing negative external effects or creating positive external effects for the natural environment and society (e.g., Boons Montalvo, Quist & Wagner, 2013). Their work has attempted to define the so-called "business models for sustainability" (BMfS), also referred to as "sustainable business models" or "sustainability business models".

The potential sustainability benefits associated with such sharing economies are interesting from an organisational and environmental perspective, but they are not the subject of this research. BMfSs consists of four business model building blocks: a value proposition, supply chain, customer interface, and financial model. Their operationalization of the four elements of a BMfS is provided below (Boons & Lüdeke-Freund, 2013):

1. Value proposition: provides measureable ecological and/or social value in concert with economic value.
2. Supply chain: involves suppliers who take responsibility toward their own as well as the focal company's stakeholders.
3. Customer interface: motivates customers to take responsibility for their consumption as well as for the focal company's stakeholders.
4. Financial model: reflects an appropriate distribution of economic costs and benefits among actors involved in the business model.

The authors consider the BMfSs framework as a viable alternative to start building a taxonomy of the key business models present nowadays in the shared mobility arena.

6. CONCLUSIONS AND THE WAY AHEAD

Only few of the emerging mobile innovations have reached commercial viability backed by real customers, and not just by institutional investors and/or government grants. In short, there seems to be a gap between solutions brought by people and the 'commercial reality'. This gap is like an underwater passage most great innovations fail to cross.

The public perception of shared goods has changed substantially in the past few years. While co-owning properties has been widely accepted for a while (e.g., timeshares), the notion of sharing bikes, cars, or even rides on an on-demand basis is just now starting to gain widespread popularity. The emerging 'sharing economy' is particularly interesting in the context of cities that struggle with population growth and increasing density.

New technologies are enabling the crowd-sourcing of transport data and the emergence of business ideas linked to shared mobility, and this in a society that progressively demands overcoming 'traditional' mobility, at the same requesting i) a flexible and adaptive transport supply with ii) greater respect for environmental considerations.

While sharing vehicles promises to reduce inner-city traffic, congestion, and pollution problems, the associated business models are not without problems themselves.

Many of the collaborative mobility platforms have a hard time finding their way to practical, large-scale exploitation. One of the reasons behind this is that the business model view on this exploitation is lacking. Many of these developments have a technology-push character, where things are developed inside out, with a focus on the concepts and the technologies involved from the very start, and with little attention for actual business deployment at the end of the day. Consequently, a clear, explicit view on commercial exploitation is often missing in these developments. This situation is made worse by the fact that complex mobility scenarios involve a multitude of stakeholders, each of which has its own business interests. Consequently, such business models with a great potential to address mobility and transportation challenges are hardly realised.

Today, TNC (transportation network company) services such as Uber seem to determine their pricing by introducing a reduction to the price of the substitute product (e.g. taxi). At the same time, we can observe that the financial results of this type of companies show losses year after year (for the Uber case: https://techcrunch.com/2019/02/15/uber-reports-3b-in-q4-revenue-rising-operating-losses/?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_cs=PLetZWiCOB-DyCnVQV004A. Retrieved on 18 March 2019), and that their survival strategy seems to be ‘burning the cash’ received from venture capital investors, with the hope of expelling their competition from the market.

Little research has been conducted on the issue of pricing the new collaborative mobility solutions, and hence this paper proposes calls for further research on the modelling the pricing of collaborative mobility solutions taking into consideration a combination of variables among which we should consider, a priori and for the case of a TNC service, the existing degree of traffic congestion, the cost of living, the cost of fuel, the price of the substitute product (e.g. taxi, public transport) and the recovery of the costs incurred by the vehicle owner (the driver or his employer).

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