

Understanding platform internationalisation to predict the diffusion of new mobility services

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Abstract

The rapid rise of New Mobility Services (NMS) along with the introduction of digital platforms are currently changing the mobility landscape, making it crucial to predict forthcoming developments. The diffusion of NMS has mostly been studied from the standpoint of user acceptance and adoption. This article introduces a complementary approach in which we examine the diffusion of NMS at the firm-level. Based on case analyses of ride-hailing, carpooling, and mobility-as-a-service (MaaS), we outline two international expansion patterns (rapid vs. gradual) and show that firm's internationalization serves as a proxy for the global diffusion of the respective NMS – typically, from developed lead markets into the developing world due to both the market leader's expansion and the emergence of followers. We emphasize the role of the business model and associated driving forces in the dynamics of diffusion of each NMS. The results of the study contribute to a better understanding of platform internationalization and give insights on how this is (re-)shaping the mobility ecosystem, presently and in the future.

Keywords

Diffusion of Innovations; Mobility Platforms; Urban Transport; Platform Business Model; Internationalization; Strategy.

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1. Introduction

The transport sector is currently experiencing a major transformation that is being triggered by technological advances and by societal changes (Cassetta et al., 2017). This has led to the improvement of existing (e.g., carpooling, car-sharing, and bike-sharing) and the development of new (e.g., ride-hailing and electric scooter-sharing) mobility solutions – often referred to as new mobility services (NMS). These NMS (Figure 1) are frequently seen as an opportunity to solve many transport's negative externalities such as congestion, and air and noise pollution. Taking advantage of digital technologies and electrification and with business models relying on the sharing economy, NMS promise to improve both the environmental sustainability and the efficiency of transport systems (Cohen and Kietzmann, 2014).

Therefore, predicting the evolution of NMS is of interest to both policy makers, transport practitioners, and scholars. These NMS are typically being implemented by technology-based start-ups that appear as new market participants in a burgeoning mobility business environment. In fact, the most successful start-ups, which are often backed with enormous venture capital and many times leverage on legal grey areas, have achieved instant global recognition and disrupted¹ rigid markets in relatively short time.

We argue that mobility start-ups take up a leading role in the worldwide diffusion process of NMS since it is through their strategic decisions regarding the expansion of activities to new geographical markets that NMS become available to users (that, subsequently, can choose to adopt the services or not). This fact has not been accounted for in the transport literature so far. Instead, the diffusion of NMS has mainly been studied through user acceptance and adoption embedded in traditional diffusion theories (El Zarwi et al., 2017). While important contributions have been made to understand the reasons behind the uptake of carsharing (Prieto et al., 2017), bike-sharing (e.g., Bakogiannis et al., 2019), ridesharing (e.g., Alemi et al., 2018), Mobility-as-a-Service (e.g., Vij et al., 2020), and so forth, these studies did not attempt to understand where these services are (being made) available in the first place.

Therefore, instead of answering the usual 'Who?', 'Why?', and 'How many?' questions at the user-level, this article introduces a new approach by addressing the 'When?', 'Where?' and 'How?' questions at firm-level:

- *Where* do mobility start-ups emerge?
- *When* and *where* do they expand to?
- *How* are NMS being introduced into new markets?

We integrate theories from international business research to answer these questions at the firm-level and to outline expansion and internationalisation activities. In this research, we narrow our view on mobility start-ups that are based on digital platforms (hereafter: mobility platforms). By understanding the internationalisation of mobility platforms, we aim to retrace

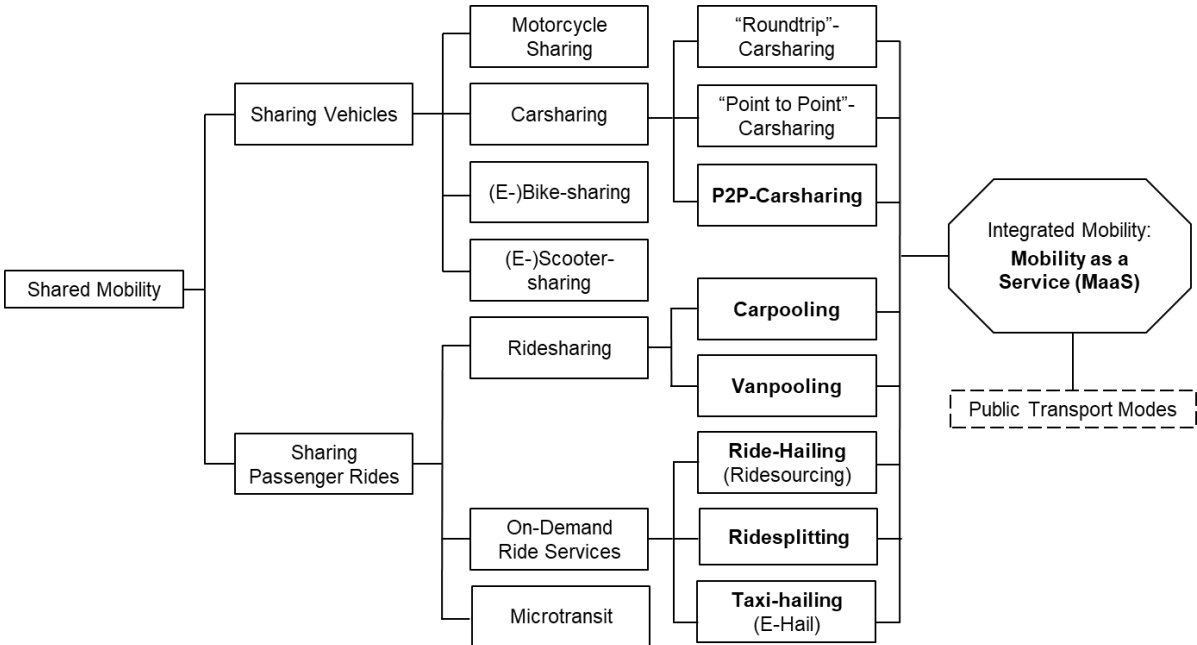
¹ A widely accepted definition for disruptive innovation was coined by Christensen et al. (2015). In this article, however, we adopt the expanded definition that – reasoning with an example based on mobility start-ups – has been suggested by Chase (2016). Accordingly, disruptive innovations are processes in which smaller firms successfully challenge incumbent businesses by creating new (e.g., Zipcar) or low-end markets (e.g., FlixBus) or by leveraging on excess capacity (e.g., Uber).

the different ways how NMS diffuse globally and (if any) outline the observed diffusion patterns which will help to predict the uptake of emerging or future NMS.

Following a multiple case-study approach, we focus on ride-hailing, carpooling, and mobility-as-a-service (MaaS). For each NMS, the respective market leaders (Uber, BlaBlaCar, MaaS Global) as well as the most relevant followers (Lyft, Cabify, Bolt, Zimride, Waze Carpool, UbiGo, etc.) are analysed.

This article makes several, multidisciplinary contributions to academic literature. First and foremost, it provides new findings about the dynamics of the emerging mobility ecosystem. Second, it contributes to existing studies on diffusion of innovation in transport by introducing a firm-level approach and by integrating transport research with theories of international business strategy. Third, while the literature on adoption of NMS mostly comprises articles that focus on single case studies in developed countries (e.g., Alemi et al., 2018; Vij et al., 2020), this research work applies a global perspective considering the global diffusion of NMS in both developed and developing countries. Fourth, it contributes to the nascent state of international business research on digital platforms (Stallkamp and Schotter, 2019) by providing case study results from major mobility start-ups. And fifth, while product innovations (e.g., vehicles' technologies) have received a great deal of attention, this article focuses on innovation in services which has been widely overlooked in both transport research (Ongkittikul and Geerlings, 2006) and general innovation studies (Wittel et al., 2016).

The remainder of this article is organised as follows. In section 2, we provide the theoretical background for this study. Section 3 details the study methods and the selected case studies for each NMS. Section 4 presents a comprehensive examination of the diffusion of NMS. Section 5 discusses the main findings. Finally, we present concluding remarks in Section 6.



*Bold marks mobility solutions that are based on platforms

Fig. 1. New mobility services in the emerging mobility ecosystem
 [Source: expanded from Shaheen and Chan, 2016]

2. Background

2.1 Innovation and Diffusion (in Transport)

Innovation is a term that is (still) employed in a rather loose way with diverse definitions in use. In this study, we adopt the OECD definition at firm-level. Accordingly, *innovation* refers to the “implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations” (OECD, 2005, p. 46). The diffusion of innovation usually starts in one country or region (the lead market), before diffusing internationally (Beise, 2004). The process is often driven by the innovator (entrepreneur, firm, etc.), who, in competitive global markets, seeks for quick international expansion to benefit from so-called lead effects (Kalish et al., 1995). At the same time, successful innovation calls followers into action who further accelerate the process of diffusion. They either imitate the innovation (imitators or “copycats”) or create, built on the predecessor, successive innovations (sequential innovators) (Bessen and Maskin, 2009).

In the transport literature, innovation and diffusion have been addressed mainly in the context of new transport technologies (e.g., Costa and Fernandes, 2012; Sousa et al., 2020). However, innovation in transport is not only expected through the integration of new technologies, but also through innovative mobility services and the development of new concepts of mobility (Cassetta et al., 2017). Most NMS spring from the developed world, where they are frequently anticipated as possible measures to loosen people’s reliance on private cars and to increase the efficiency and sustainability of the overall transport system.

In developing countries, in contrast, lower technological capabilities and reduced financial resources for R&D result in lower involvement in innovation activities (Da Silveira, 2001). Notwithstanding, pioneering cities from the Global South (e.g., Bogotá and Curitiba) have successfully demonstrated the introduction of low-cost transport innovations such as the BRT (OECD/ITF, 2019). Scientific literature, however, has not acknowledged the actual relevance and potential of transport innovations in developing countries and rarely addressed adoption and diffusion of NMS in its context (Acheampong et al., 2020).

2.2 Sharing Economy and the Platform Business Model

The sharing economy, also referred to as collaborative consumption, is an important concept to understand recent developments in the mobility ecosystem. Despite being widely acclaimed, however, a common approach for the conceptualisation of the sharing economy has yet to be developed. Cockayne (2016), for example, uses the term to summarise digital platforms that connect consumers to a service or commodity through mobile apps or websites. These platforms create value by promoting and facilitating transactions between different types of users (Evans and Gawer, 2016). Compared to long-established solutions, platforms typically provide improvements such as on-demand availability, efficiency, and convenience (Still et al., 2017). An important characteristic of platforms is the creation of two-sided markets, where different user segments can interact with each other. The more users a platform has on each side, the greater are the benefits for all participants of the platform. This relation is also referred to as network effects (Parker and Van Alstyne, 2005).

In the context of this article, it is worth considering platforms from the perspective of the business model concept and thus relating to the Platform Business Model (Osterwalder and

Pigneur, 2010). Scholars describe a business model (BM) as the 'logic of the firm' (Casadesus-Masanell and Ricart, 2010). It defines how a business creates and delivers value to customers and outlines the firm's architecture of revenues, costs, and profits (Teece, 2010). The BM inevitably demonstrates the firm's performance to the external environment. In response, it may thus serve as a template and potentially may call for imitation.

While a great amount of attention has been attributed to the idea of novelty creation through BM innovation, the replication of BMs has been widely overlooked in the scientific literature (Aspara et al., 2010). Yet, refining existing BMs for replication into new geographical locations signifies a promising strategy to maintain growth and maximise value (Winter and Szulanski, 2001). This requires recognising the valuable traits of the BM, knowing how these traits can be replicated, and identifying suitable locations where solutions with such traits can be successfully implemented (Winter and Szulanski, 2001).

Scalability is another decisive attribute of BMs relating to its function to contribute to the growth of a firm. In other words, scalable BMs are able to increase revenues from additional resources faster than the underlying cost base (Stampfl et al., 2013). Platforms have high scaling potential if they can continuously gain users on both sides at a marginal cost for additional transaction close to zero (Täuscher and Kietzmann, 2017). This can be achieved by delivering higher value propositions relative to existing alternatives (Lund and Nielsen, 2018) while reducing transaction costs and/or enhancing the efficiency of matching (Brousseau and Penard, 2007).

2.3 Internationalisation of Digital Platforms

While the concept of diffusion relates to the innovation (e.g., a NMS), the concept of international expansion – or internationalisation – relates to the firm and describes the process in which a firm (e.g., a mobility service provider) increases its international involvement. Internationalisation of firms can be achieved through different options, including exports, licensing, and foreign direct investment. In this article, the latter way of international expansion is of particular interest, as it involves two main options: setting up start-ups from scratch or acquiring foreign ventures (Barkema et al., 1998).

Classical theory (Johanson and Vahlne, 1977) claims that internationalisation is the product of a series of incremental decisions in which knowledge about foreign markets and foreign market commitment are gradually increasing over time. Hence, firms increase their activities abroad gradually (gradual internationalisation). Due to their nature of intangible assets, however, platforms can potentially adapt rapidly into different markets at lower costs (rapid internationalisation) (Parente et al., 2018). One of the influential forces that determine the speed of internationalisation, according to Oviatt and McDougall (2005), is the motivating force of competition. Technology-based firms are particularly impacted by global competition (Onetti et al., 2012), which is why many platforms aim for internationalisation near to inception. Hereby, leveraging on first-mover advantages is seen as a critical factor to gain competitive advantages (Parente et al., 2018).

Once first activities have been established abroad, the pace of internationalisation is further determined by the expansion strategy. Logically, an approach in which many markets are targeted for entry at the same time (sprinkler strategy), allows to expand much faster than targeting new markets successively (waterfall strategy) (Kalish et al., 1995). With regards to

market selection, one option is to target a diverse set of country markets in different geographical locations (geographical diversification). In contrast, geographical concentration refers to the case, where firms try to achieve market share only in selected markets in close geographic proximity (Ayal and Zif, 1979).

Stallkamp and Schotter (2019) found that the geographic scope of network effects (*within-country* or *cross-country*) further influences platforms' key internationalisation decisions. An important finding is that global strategies are more likely to be pursued by platforms creating network effects that extend across borders.

An internationalisation model for digital platforms has been developed by Ojala et al. (2018). It considers four stages that platforms follow in their path towards globalisation (Fig. 2). After inception, in the *Establishment* phase, platforms start to look for ways to commercialise internationally. *Early internationalisation* is as a case-dependent intermediate step to overcome technical/strategic bottlenecks (e.g., legal provisions that prevent carriage of passengers by unregulated NMS such as ride-hailing and carpooling) or to acquire necessary resources. In this phase, the platform is only capable to enter selected markets, in which no obstacles exist and where potentially missing resources are obtainable. The next phase is the *Commercialisation*, in which platforms can aim for customer bases in larger markets. Finally, in the *Globalisation* phase, the platform is expected to be mature and globally accepted.

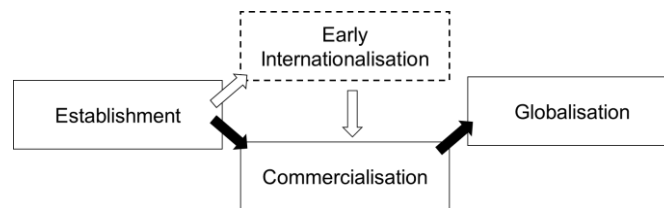


Fig. 2. Internationalisation Model for Digital Platforms
[Source: adapted from Ojala et al., 2018]

3. Methodology

Building on the concepts and theories described in the background chapters, we advance the following propositions to address our research objective:

- Proposition 1: The rapid or gradual internationalisation of firms (i.e., mobility platforms) reported in the literature, determine rapid or gradual diffusion of innovations (i.e., NMS).
- Proposition 2: Whether mobility platforms follow a rapid or gradual internationalisation is influenced by various (inter-related) factors including (a) the BM, (b) network effects, (c) competition, and (d) the expansion strategy (Table 1).

Table 1. Overview of explanatory variables for the case analyses

Variable	Classification	Reference
Business Model		
a1 -Replicability	low/medium/high	Winter and Szulanski, 2001
a2 -Scalability	low/medium/high	Brousseau and Penard, 2007; Lund and Nielsen, 2018; Täuscher and Kietzmann, 2017
Network effects		

b1	-Geographic scope Competition	within-country/cross-country	Stallkamp and Schotter, 2019
c1	-Geographic scope	local/regional/international	Onetti et al., 2012; Oviatt and McDougall, 2005; Parente et al., 2018
c2	-Intensity Expansion strategy	low/medium/high	
d1	-Market selection	geographical diversification/ geographical concentration	Ayal and Zif, 1979
d2	-Market entry	sprinkler/waterfall	Kalish et al., 1995

For our analysis, we follow a multiple case study approach. Compared to a single case study, this allows to obtain more compelling evidence and more in-depth understanding, therefore being considered as more robust (Eisenhardt and Graebner, 2007). Yamashita and Moonen (2014), nevertheless, refer to case selection bias as the biggest challenge of this research method.

We analyse one NMS for each of the stages in the internationalisation model for digital platforms (Ojala et al., 2018), only excluding the first stage (establishment in the lead market) in which internationalisation efforts are yet to be observed. Following a purposive sampling approach, we select MaaS, carpooling, and ride-hailing for the early internationalisation, commercialisation, and globalisation stage, respectively. We consider these as the most instructive cases, as they represent NMS that have attracted much interest from the private sector (read off by the raised venture capital funding of each) and that are well-studied in the scientific literature. Our analysis starts with the market leaders – Uber (ride-hailing), BlaBlaCar (carpooling), MaaS Global (MaaS). Expecting that more successful solutions call for increased imitation, we further analyse the most relevant followers, that are either imitators and/or sequential innovators (Table 2).

Table 2. Overview of case studies

Case	NMS	Internationalisation Stage	Market Leader	Imitators and Sequential Innovators
I	Ride-Hailing	Globalisation	Uber	Lyft, Cabify, Bolt, Didi Chuxing, Grab
II	Carpooling	Commercialisation	BlaBlaCar	Zimride, Waze Carpool, Wunder Mobility
III	Mobility as a Service (MaaS)	Early Internationalisation	MaaS Global	UbiGo, Free2Move, moovel, etc.

The data for this study has been collected from available primary literature and a web search relying on various online sources (organisations' official online channels, press releases, blog posts, industry reports, local newspaper articles, published interviews with representatives, etc.). We are confident that the data collection, being conducted in unobtrusive, exhaustive manner, yields a close representation to reality. However, even though available data from online sources help to avoid selection bias by data providers (Edelman, 2012), some doubts regarding accuracy and reliability of such data naturally remain. Note that the mobility ecosystem is affected by strong market dynamics. We therefore need to mention that the

information cut-off for our data is October 2019, and that some information may not be valid anymore by the time of publication.

With regards to the origin of start-ups and where they expand, our analysis includes a distinction between developed countries and developing countries which is relevant in the context of both transport and international business studies. Based on World Bank data, we consider countries listed in the group of high-income economies as developed countries and the remaining as developing countries (World Bank, 2019).

4. Diffusion of New Mobility Services

4.1 Ride-Hailing (Globalisation stage)

Ride-hailing, also referred to as ‘ridesourcing’, describes a point-to-point on-demand mobility service, in which passengers hail drivers via mobile apps (Jin et al., 2018). The passengers and drivers connect on online-enabled platforms that are operated by ride-hailing companies, also called Transport Network Companies, TNCs (Jin et al., 2018). A distinctive feature is that the TNC does not own the vehicles itself, instead, vehicles are owned by the supplier (a company or an individual). The main reasons for passengers to use ride-hailing services have been identified as low prices and convenience (to book rides online, to use the same app in different cities/countries), as well as short waiting times (Rayle et al., 2016). Despite creating huge controversies and immense protest from the taxi industry, in many cases resulting in legal battles, ride-hailing services have become a global phenomenon being operated in many parts of the world (Table 3).

Table 3. Evolution of ride-hailing services: First launch in selected cities

Innovation	Diffusion in Developed Countries	Diffusion in Developing Countries
San Francisco (July 2010)	New York City (May 2011)	Santiago de Chile (November 2012)*
	Paris (December 2011)	Mexico City (January 2013)*
	Madrid (January 2012)*	Bangalore (August 2013)
	<i>Barcelona (February 2012)*</i>	Johannesburg (August 2013)
	Toronto (March 2012)	Bogotá (September 2013)
	London (July 2012)	Kuala Lumpur (January 2014)
	Sydney (November 2012)	Manila (February 2014)
	Singapore (January 2013)	Rio de Janeiro (April 2014)
	<i>Berlin (February 2013)</i>	Beirut (July 2014)
	<i>Rome (May 2013)</i>	Beijing (July 2014)
	<i>Seoul (June 2013)</i>	Bangkok (October 2014)
	Dubai (September 2013)	Colombo (December 2015)
	<i>Tokyo (November 2013)</i>	Lagos (July 2014)
	Moscow (November 2013)	Cairo (November 2014)
	Doha (January 2014)	Nairobi (January 2015)
	Brussels (February 2014)	Minsk (November 2015)
	Lisbon (July 2014)	Baghdad (January 2018)*

Asterisk marks locations where ride-hailing services have first been introduced by followers
 Italic marks locations where ride-hailing services are banned or significantly restricted (as at June 2019)

4.1.1 Uber (Market Leader)

A major role in the rapid development of ride-hailing is played by Uber. Founded in March 2009, Uber first introduced ride-hailing services in San Francisco, USA, in 2010. Meanwhile, Uber offers several transport-related services under brands such as UberTaxi, UberPool, and Jump. With Uber Eats, the portfolio even includes a meal delivery service. The core and most important service, however, remains ride-hailing. Although Uber initially operated in a legal grey area and despite opposition from the taxi industry, users highly demanded for Uber's services. While continuously raising capital, Uber has sought to expand and offer services in more cities. The company's national expansion began in May 2011 with the launch in New York City. Since then, Uber has experienced rapid growth - both nationally and internationally. For insights regarding Uber's diffusion patterns in the USA, the reader is referred to Berger et al. (2018) and Hall et al. (2018). The first step of Uber's international expansion marks the launch in Paris, France, in December 2011. First imitators have been founded since 2012 and onwards, emerging in both the developed and the developing world (Fig. 3). In many cases, however, they initially offered taxi-hailing services before focussing on ride-hailing.

Uber's international expansion first included cities in Europe, Canada, and Australia, before starting to launch in developing countries. Uber arrived in Mexico City in June 2013, six months after the imitator Cabify had launched in the city. Since August 2016, according to the collected data, Uber offers ride-hailing services (labelled as UberBlack for the premium service and UberX, UberXL, or UberPop for cheaper services) in more developing countries than in developed countries. In total, it has launched in 77 different countries, but in some was forced to withdraw. In developed countries mainly due to legal constraints such as bans and restrictions imposed by local authorities (e.g., in Germany, Denmark, and South Korea). In developing countries, where typically fewer regulatory issues can be expected, Uber, in a few cases, draw back from operations and partnered with strong local competitors (e.g., Didi Chuxing in China and Grab in Southeast Asia). With the acquisition of Dubai-based Careem in March 2019, another major competitor has been taken over. Careem, however, keeps operating separately and under the old brand in the Middle East, Africa, and South Asia.

As could be expected, a scatter plot ($R^2=0.32$) of Uber's entry in European cities shows a negative correlation of the city's population size and the respective Uber launching date (Fig. 4). This means that Uber first launched in cities with relatively high population, before launching in lower populated cities. The same has been observed in the US market (Berger et al. 2018; Hall et al., 2018) and supports the general assumption that platforms rely on widespread user adoption and therefore target regions with dense urban populations. It further reveals that the expansion started in Western European countries (France, UK, Netherlands, Germany, Italy, etc.), before Uber also begun targeting cities in Eastern Europe (e.g., in Russia, Romania, Poland, Ukraine, etc.). The most recent launches mainly include relatively small cities in Western Europe (e.g., Coimbra or Graz) as well as cities where Uber has faced strong opposition (e.g., Cologne or Seville).

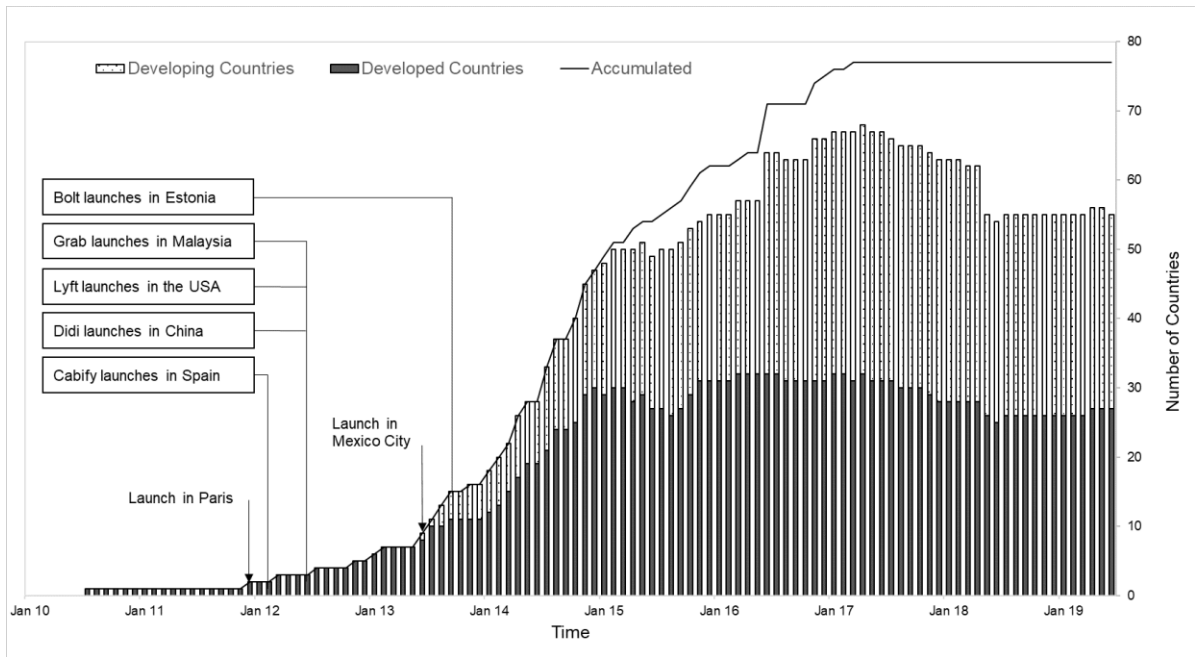


Fig. 3. Expansion of Uber and launch of major competitors

Note: The accumulated line represents the total sum of countries in which Uber has launched ride-hailing services over time, while the bars refer to the number of countries in which Uber was active at a given time.

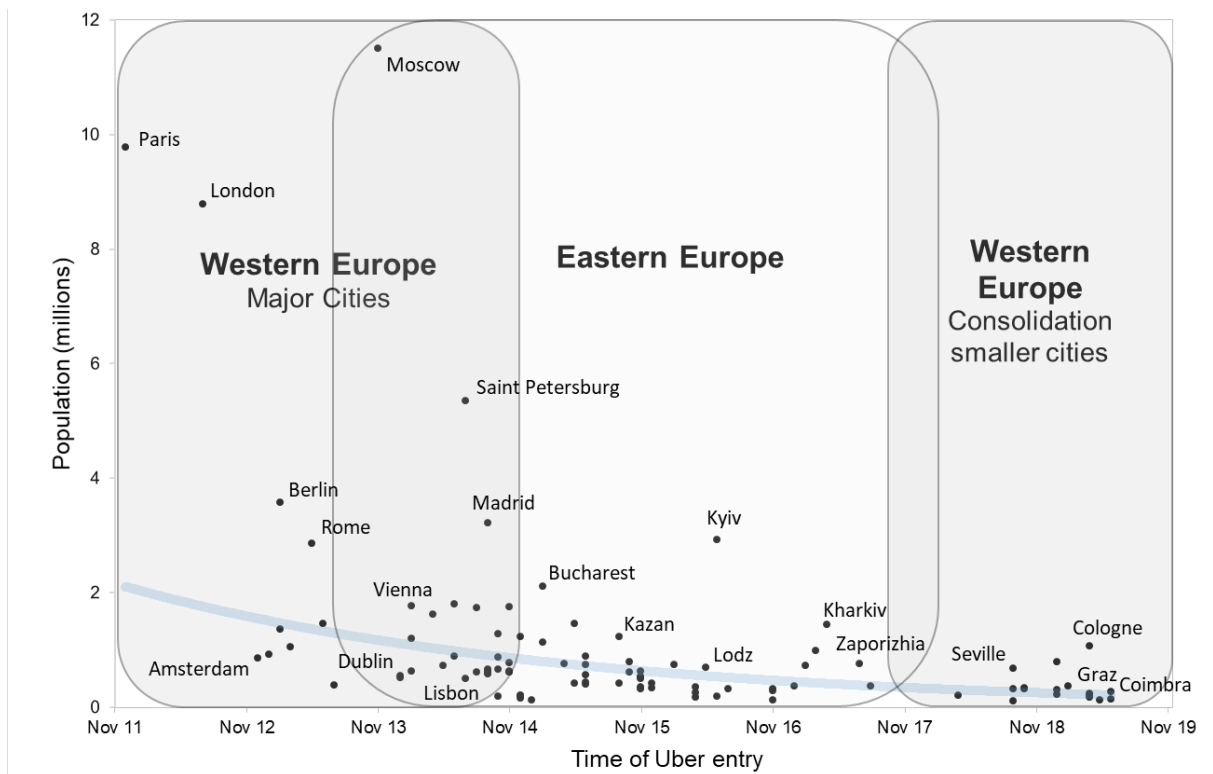


Fig. 4. Scatter plot of Uber expansion in Europe (city population against time of Uber entry)

4.1.2 Imitators and Sequential Innovators

Unsurprisingly, Uber's success has called competitors to the scene who tried to copy the Uber BM (Table 5). They include Lyft, Uber's biggest rival in the US market. Lyft launched in June 2012 and quickly boasted tremendous success. However, Lyft focuses only on North America as their expansion activities so far only affected cities in the USA and Canada.

International competition, nevertheless, is equally prevalent as imitators have emerged in many parts of the world. There are a few examples of regions where imitators have been able to establish ride-hailing services before Uber was able to roll-out. This refers, for example, to Spain – the home market of Cabify. Founded in 2011, Cabify launched in Madrid and Barcelona in early 2012. It started by offering "Executive" ride-hailing services with limousines (comparable to UberBlack) and later introduced a cheaper "Lite" service (comparable to UberX or UberPop). In Europe, Cabify's expansion so far only included its neighbour country Portugal. Due to cultural and linguistic proximity (Ghemawat, 2001), it quickly expanded into Latin America, however. As at June 2019, Cabify was operating in 10 countries in Latin America, which has become the company's most important market. As especially the "Lite" service enjoys great demand, Cabify continues to pursue a geographical concentration strategy in Latin America by adding additional cities to its portfolio. Recognising regional peculiarities, they have also introduced adjusted services in some cities such as the carriage via motorbikes.

The Estonian start-up Bolt is another competitor from Europe. Starting with taxi-hailing services (initially under the name "Taxify"), the company has become a leader in the Baltics region. However, Bolt was also aiming for growth and has expanded both its service area and its offering. As at June 2019, it was operating in 34 countries on four continents with a focus on ride-hailing. Bolt has become very successful in Africa, where it claims to be the number one ride-hailing company and the first to offer ride-hailing with motorbikes which enjoys great popularity.

Ride-hailing has not only been brought to the developing world through international expansion, instead, several new start-ups have been founded in developing countries as well. The most prominent examples include Didi Chuxing and Grab. Both emerged as the market leaders in their home market in China and Southeast Asia respectively.

Other notable ride-hailing companies from developing countries have furthermore modified the ride-hailing BM with regards to vehicle deployment. For instance, Angkas from the Philippines and Indonesian GoJek, both deploying motorbike taxis, and Indian Ola Cabs which also offers services with auto rickshaws.

Table 4. Major ride-hailing imitators and sequential innovators

Start-Up	Origin	Launch	Focus Region	Services
Cabify	Spain	2012	Latin America	Ride-hailing
Lyft	USA	2012	North America	Ride-hailing, Bike- and e-scooter sharing
Didi	China	2012	China, Mexico, Australia	Ride-hailing, Taxi-hailing, Carpooling, Bike-sharing
Grab	Malaysia/ Singapore	2012	Southeast Asia	Ride-hailing, Taxi-hailing, Grocery delivery, Parcel delivery, and more
Bolt	Estonia	2013	(Eastern) Europe, Africa	Ride-hailing, e-scooter sharing

4.2 Carpooling (Commercialisation stage)

Carpooling is a form of ridesharing where a driver and up to six passengers share a ride in a private car (Shaheen and Cohen, 2019). Offering carpools usually proceeds without any profit-oriented intention. Instead, the motivation for drivers is to find passengers who are incidentally travelling a similar origin-destination to share the operating expenses. This idea has been in use for decades, especially among family members, neighbours, co-workers, fellow students,

and so forth. Internet-based technologies have recently facilitated the pairing of drivers and potential passengers and introduced public carpooling through websites and mobile apps. In this process, carpooling has also expanded from the urban context (such as work trips) to inter-city travel.

On the one hand, carpooling is seen as a very sustainable model among the shared-mobility solutions in terms of reducing congestion, travel resources, and greenhouse gas emissions, while on the other hand, it is also believed to be a relatively unattractive alternative for travellers, considering disbenefits in terms of travel time and flexibility (Santos, 2018).

4.2.1 BlaBlaCar (Market Leader)

BlaBlaCar, founded 2006 in France, is one of the pioneers and largest carpooling companies. While the service was initially only available on its online website, most drivers and passengers are now matched through the BlaBlaCar mobile app which launched in December 2009. Since the service is meant for inter-city travel, users generate fewer trips compared to shared-mobility services in the urban environment. Accordingly, BlaBlaCar operates on a (multi-)national level. The company's internationalisation started with launches in Spain (2009) and in the UK (2011), adding several more European countries in the following years. Fig. 5 shows that the expansion was progressively carried out during separate phases. After expanding to a neighbour country (e.g., Spain), they successively entered countries in the next proximity (e.g., Portugal) – indicating that BlaBlaCar pursues a contiguous expansion strategy. In this way, BlaBlaCar creates cross-country network effects through international trips (e.g., from Spain to Portugal and vice versa). While the initial focus was on Western European countries, the expansion then increasingly turned to the east.

It is also noteworthy that BlaBlaCar, in addition to its own expansion (e.g., to the UK), has entered several countries through the acquisition of competitors. This refers to the cases in Italy (PostoinAuto.it), Ukraine and Russia (Podorozhniki), and Hungaria, Croatia, Romania, and Serbia (AutoHop). BlaBlaCar has also expanded to first non-European countries, namely India, Mexico, and Brazil (all in 2015). These countries, like other emerging economies, certainly provide huge potential due to their large population and megacities (such as Mumbai, New Delhi, São Paulo, and Greater Mexico City), whereas also distinctive downside such as long distances between major cities and low(er) car ownership are present. Nonetheless, BlaBlaCar has not further expanded in the developing world and only launched in the Czech Republic and Slovakia (2016) since then.

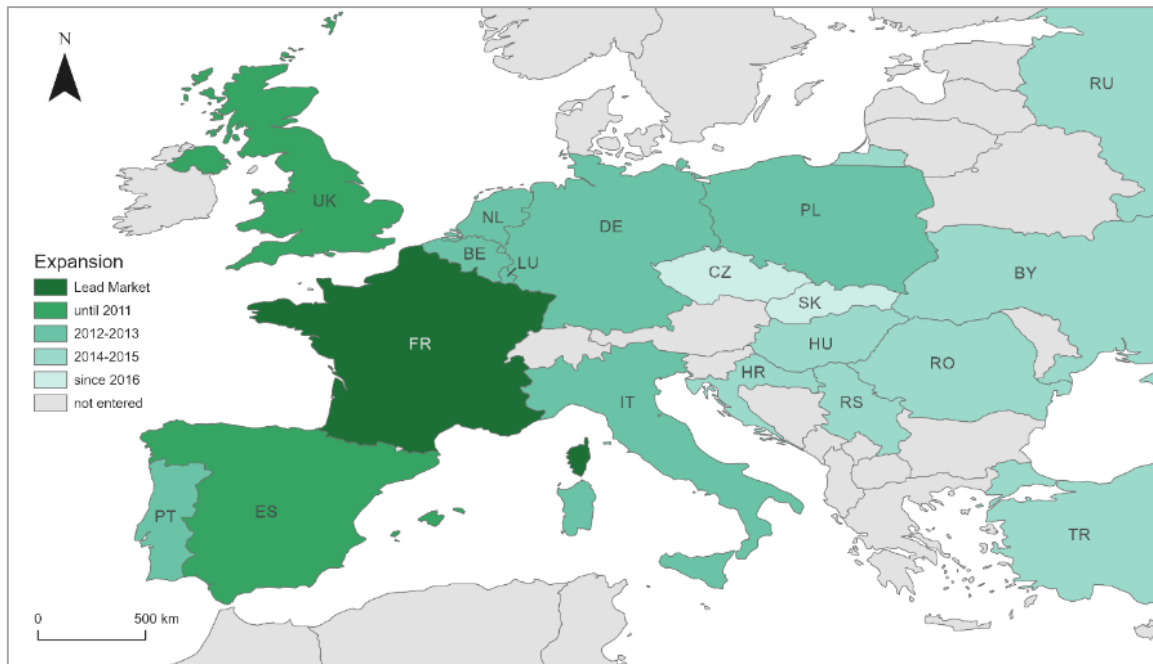


Fig. 5. BlaBlaCar Expansion in Europe

4.2.2 Imitators and Sequential Innovators

In the digital age, drivers and passengers have several options to organise carpools. Amongst others, advertisement websites (e.g., Craigslist) and social media (e.g., Facebook groups) are being used to match people who want to share a ride. There are also countless smaller and usually less well-known website-based carpooling platforms. But also, more sizable and VC-backed start-ups such as Zimride, Waze Carpool, and Wunder Mobility have emerged in recent years (Table 6).

Zimride, that has later spawned Lyft, was founded in 2007. It operates with a concept that is slightly different compared to what BlaBlaCar has established in Europe. Universities and companies use Zimride to create and promote their own private carpooling network. Addressing the issue of safety, which is a major concern regarding public carpooling (Kelly, 2007), Zimride therefore only connects people that are working/studying at the same company or institution. Zimride, same as Lyft, is currently only available in the USA and Canada.

A more recent player in the carpooling business is the Alphabet-owned community-driven GPS navigation provider Waze. Leveraging from user-submitted travel times and route details, Waze is intending to make carpooling operations more efficient and available on intra-city level. Waze Carpool has first launched in 2016 in the San Francisco Bay Area and since expanded to all States in the USA. Regarding the expansion of their carpooling service, that is now also available in Israel, Brazil, and Mexico, Waze benefits from already having millions of active users (for the navigation service) worldwide.

Another start-up focusing on intra-city carpooling is Wunder Mobility from Germany that was founded in 2014. Besides carpooling, Wunder Mobility also provides microtransit services (Wunder Shuttle) as well as car and electric scooter-sharing (Wunder Fleet). The company is active in more than 50 cities worldwide. However, due to the strict local transport regulation in the German home market (and in many other European countries), Wunder Carpool is focussing on emerging markets and is now only available in Brazil and India. Until June 2019,

they also operated in Metro Manila, Philippines, but have ceased services presumably due to unresolved regulatory issues.

Sequential innovators from developing countries such as Indian sRide and Quick Ride, furthermore, addressed the issue of low car-ownership and thus introduced motorbike pooling.

Table 5. List of major carpooling companies

Start-Up	Origin	Launch	Carpooling Adaptation	Available in
BlaBlaCar	France	2006	Inter-city carpooling	Brazil, India, and 19 countries in Europe
Zimride	USA	2007	Corporate carpooling	USA, Canada
Wunder Carpool	Germany	2014	Intra-city carpooling	Brazil, India
Waze Carpool	USA	2016	Intra-city carpooling	USA, Israel, Brazil, Mexico

4.3 Mobility-as-a-Service (Early Internationalisation stage)

Mobility-as-a-Service (MaaS) is a relatively new phenomenon that is currently receiving much attention from both the public and private sector and the scientific community. Due to its novelty, the term is currently being addressed rather vaguely, and there is still no accepted definition for MaaS (Utriainen and Pöllänen, 2018). Nevertheless, in its most prevalent perception, MaaS describes a NMS that combines private and public transport services into a single platform accessible on demand. Several start-ups and initiatives are being associated with this concept, although they greatly differ in terms of service features and functionality. In this context, Kamargianni et al. (2016) identified four main elements of MaaS schemes. They are ticket, payment, and ICT integration as well as the offer of mobility packages (also mobility plans or bundles). We support the view that these elements, in conjunction, have the greatest impact to provide a seamless intermodal user-experience that could significantly shape the future of urban transport. In the following, we therefore consider those services that contain all four elements as “full” MaaS schemes.

4.3.1 MaaS Global (Market Leader)

The provider of the first full MaaS scheme is Finnish start-up MaaS Global. Their service – called Whim – was launched in November 2017 in Helsinki, Finland. Currently, it offers a “pay-as-you-go” service as well as three different mobility packages with limited or unlimited mobility services. In media and in the popular press, Whim’s Helsinki model is considered a success and a guide for future urban transport. Within the first two years of operation, the company claims that 20,000 registered Whim users have completed about two million trips.

International expansion started in Birmingham/West Midlands, UK, and Antwerp/Flanders, Belgium, where full services started in March 2018 and October 2018 respectively. In October 2019, Whim also launched in Vienna, Austria. According to Whim Co-Founder Kaj Pyyhtiä, however, this marks only the beginning of its internationalisation as their goal is to cover 60 countries until 2023 (ITS International, 2018). For any future expansion, partnerships with authorities (to provide favourable conditions to operate a MaaS system) and local companies (to provide the transport services) will be necessary. Among many factors, the strong commitment and support by the public sector, including the Finnish Ministry of Transport, was crucial for Helsinki to become the pioneer city for MaaS (Audouin and Finger, 2018). In general,

transport providers are expected to be interested in bundling services (Mulley et al., 2018) and joining a MaaS scheme to increase market shares and revenues (Polydoropoulou et al., 2018). However, they would need to agree that the MaaS operator collects a commission and would be required to open data to third parties. Due to the involvement of many stakeholders (with different and competing interests), building partnerships, thus, appears to be MaaS Global's biggest challenge to become "global".

4.3.2 Imitators and Sequential Innovators

Between November 2013 and April 2014, a full MaaS scheme was tested during a 6-month field trial in Gothenburg, Sweden. Despite the positive feedback that 97% of participants (N=195) would like to continue using the service called UbiGo (Karlsson et al., 2016), full operation has not yet started – however, a second pilot is currently being tested in Stockholm.

Another full MaaS scheme called SHIFT was available in Las Vegas, USA. Instead of integrating different transport providers and services on a single platform (Helsinki model), the start-up operated completely with its own vehicles. In 2015, however, the service was shut down after two years of operation. Therefore, to the authors' knowledge, Whim is currently the only available full MaaS scheme worldwide. Their potential competitors for the future, nonetheless, are numerous. Transport providers from the rail (Deutsche Bahn/ioki), public transport (BVG/Jelbi; Hamburger Hochbahn/switchh), and the car rental industry (Europcar Groupe/Ubeeqo) have already introduced own platforms. Also, transport authorities (Transit Authority of River City/TARC; Roads and Transport Authority Dubai/S'hail) and cities (City of Graz/tim) are working on MaaS solutions. Even carmakers are changing their business strategies and are entering the mobility ecosystem (Daimler/moovel; Groupe PSA/Free2Move). Finally, large tech and conglomerate companies are gaining a foothold in the market and deliver own solutions or the necessary technology (IBM France/Optimod'Lyon; Siemens/SiMobility). The mentioned projects, however, currently only provide a partial integration or are still in a pilot or research phase (Table 6).

Table 6. List of MaaS schemes

MaaS Scheme	Launch	Integration type	Available in
TransitApp	2012	Partial	125+ cities in USA, UK, Canada, Europe, Australia
moovel	2012	Partial	Stuttgart, Hamburg, Vienna, Portland
<i>SHIFT</i>	2013	<i>Full</i>	<i>Las Vegas</i>
<i>UbiGO</i>	2013	<i>Full</i>	<i>Gothenburg, Stockholm</i>
switchh	2013	Partial	Hamburg
Optimod'Lyon	2015	Partial	Lyon
Ubeeqo	2015	Partial	Barcelona, Madrid, Berlin, Hamburg, Brussels, London, Milan, Paris
tim	2016	Partial	Graz
Free2Move	2016	Partial	20+ cities in Germany, France, Spain, Italy, UK, Austria, USA, Belgium
Whim	2016	Full	Helsinki, Birmingham, Antwerp, Vienna
S'hail	2019	Partial	Dubai
TARC	2019	Partial	Louisville (Kentucky)
Jelbi	2019	Partial	Berlin

Italic marks MaaS schemes that are not operational anymore (SHIFT) or that are still in a pilot/research phase (UbiGO)
This list makes no claim to completeness

5. Discussion of results

5.1 Business model and network effects

Our analysis shows that Uber has experienced the most rapid evolution (Fig. 6), which among other factors can be attributed to its highly replicable BM. Uber has launched their service in dense urban areas worldwide, where they serve similar user needs and provide an efficient alternative to incumbent services (e.g., taxi or public transport). Across different markets and countries, the ride-hailing BM only requires minor adjustments such as the use of different vehicles. BlaBlaCar's BM, on the other hand, is conceptualised for the long-distance market at inter-city level. They therefore seek for countries and regions with a constellation/dense network of large cities located within a few hundred kilometres from each other. These conditions are generally found in Europe, where the platform has grown steadily. While inter-city carpooling therefore appears to be only viable in Europe, Zimride's corporate carpooling has not outgrown the North American market. Thus, the carpooling BM provides only low replicability potential (hence, the "need" for different firms to make adaptations to the BM). The MaaS BM even needs to be adjusted in every context, depending on the existing regulation, available transport services, and so forth. For this reason, the replicability of the MaaS BM appears to be low, which could explain the very manageable number of operating MaaS schemes so far.

The analysis further underlines that the Uber BM is highly scalable. It provides strong incentives on both user sides, whereby the trigger to initiate transactions is located on the demand side. Through the Uber-app, passengers can conveniently book trips online. Most users make use of the service regularly and book rather short trips (Rayle et al., 2016). This makes it attractive for professional drivers to join the platform as well. Online accessibility and the efficient matching allow a high utilisation of resources, making it easier to reach a critical mass. In contrast, carpooling follows a "supply push" approach, where non-professional drivers offer seats on private trips. Even if these drivers would regularly provide carpools (e.g., on their daily commute), the total number of offered trips would usually still be quite low. As carpooling does not intend any profit-making, there are not many incentives for drivers to offer additional trips. Also, most users would not frequently demand long-distance trips. Compared to NMS in the urban environment (e.g., ride-hailing), fewer transactions are therefore generated. The scaling potential of the carpooling BM is therefore rather low. For MaaS schemes, scaling is linked to several challenges and uncertainties (e.g., related to governance and stakeholder commitment). Once a MaaS scheme is able to unify several existing service providers and transport modes under its platform, it instantly covers a significant number of urban trips. While the BM design in theory seems very promising, its implementation is fairly difficult. We thus classify the potential for scalability of the MaaS BM as rather low/medium.

While Uber and MaaS Global are generating significant network effects in the urban environment, only BlaBlaCar considerably generates cross-country network effects as they enable cross-border carpooling trips. However, this only applies to countries in close geographical proximity. Therefore, the geographic scope of network effects does seemingly not (or only to a certain degree) play a determining role in the internationalisation activities of mobility platforms.

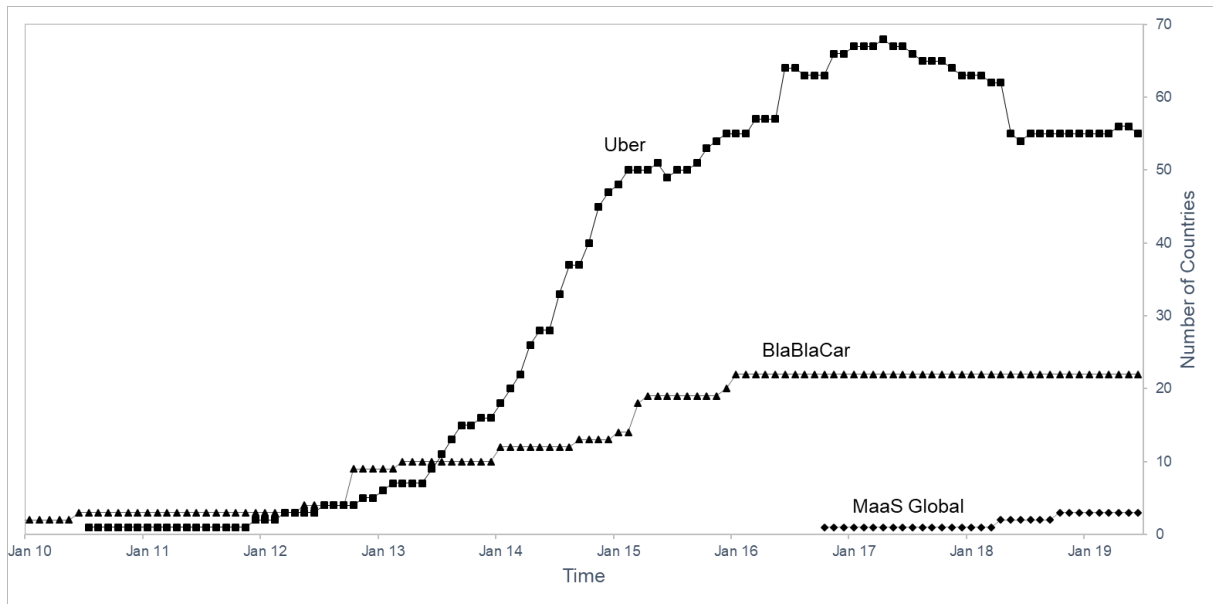


Fig. 6. Expansion of market leaders over time (Jan 2010 – Jun 2019)

5.2 Competition and expansion strategy

Among the analysed NMS, ride-hailing represents the most competitive market. The market leader, Uber, is facing strong competition at both the home market (i.e., Lyft) and internationally (i.e., Cabify, Bolt, DiDi, Grab, etc.). In many profitable markets, Uber is fighting over market shares with at least one competitor (in addition to the intermodal competition). To maintain the required growth, Uber thus followed an aggressive expansion strategy and targeted dense urban areas all around the globe (geographical diversification strategy). Hall et al. (2018) have cited Uber officials claiming that their goal was to cover as much of the US and the world as soon as possible. Enabled through the replicable BM, Uber has thus entered new markets shortly after another or even simultaneously (sprinkler strategy).

While BlaBlaCar's strongest competition is coming from alternative transport modes such as long-distance buses and trains, rather small regional competitors have frequently been acquired as part of their expansion strategy. BlaBlaCar first targeted country markets in the next proximity that they entered during different phases (waterfall strategy). Furthermore, BlaBlaCar has primarily focused on the European market (geographical concentration strategy), in countries where its BM is replicable and where carpooling was already established.

Even though there is a huge interest in the MaaS market and several prospective MaaS players, MaaS Global has not faced any direct competition on local level so far (i.e., another MaaS provider competing in the same city). Such situation seems also unlikely to occur in the future as MaaS rather leads to a "all-or-nothing" scenario (Hasselwander et al., 2019). In addition, in case MaaS Global maintains its position as the market leader for MaaS, one could expect that it acquires regional MaaS start-ups or cooperates with local entities to set a foot into new markets in the future. Presumably, mostly in cities with similar conditions as in their home market (e.g., in Europe).

5.3 Diffusion patterns of NMS

Building on the observations from the three case studies, we draw two diverging diffusion patterns for NMS that differ in terms of speed, intensity, and driving forces involved (Fig. 7).

We found that mobility platforms with scalable, replicable BMs that are facing fierce competition (i.e., high number of sizable competitors on local and international level) – such as in the ride-hailing case – aim to expand quickly which enables a *rapid diffusion* of the concept and a short time to reach the globalisation stage. In such cases, the market leader is typically the driving force and introduces and establishes the NMS in several new markets (e.g., as observed by Uber). At the same time, international competitors contribute to the uptake of the NMS, but typically not as a first mover or only in selected niche markets (e.g., Cabify in Latin America).

In contrast, the carpooling concept represents an example for a *gradual diffusion*. The carpooling BM provides less potential in terms of scalability and replicability. Hence, the market leader and different sequential innovators push forward the NMS with adjusted BMs in geographically concentrated markets (e.g., BlaBlaCar in Europe and Zimride in North America). A direct competition among major carpooling companies within the same market is often non-existent. This leads to a slower global diffusion of the concept and a longer period required to reach the globalisation stage.

Regarding MaaS, the initial expansion activities of the innovator point to a gradual diffusion. MaaS Global’s BM is not easily replicable/implemented and is difficult to scale. While the concept is therefore still in its early internationalisation, we note that the uptake of MaaS also depends on public policies, stakeholder commitment, and regulatory change (Karlsson et al., 2019). This brings new players (e.g., cities and transport authorities) on the agenda that could accelerate MaaS diffusion. While there seem to be some evidence that the public sector is indeed pushing for MaaS and integrated transport (Smith and Hensher, 2020), this was not part of our analysis. We therefore recommend addressing this aspect in future research.

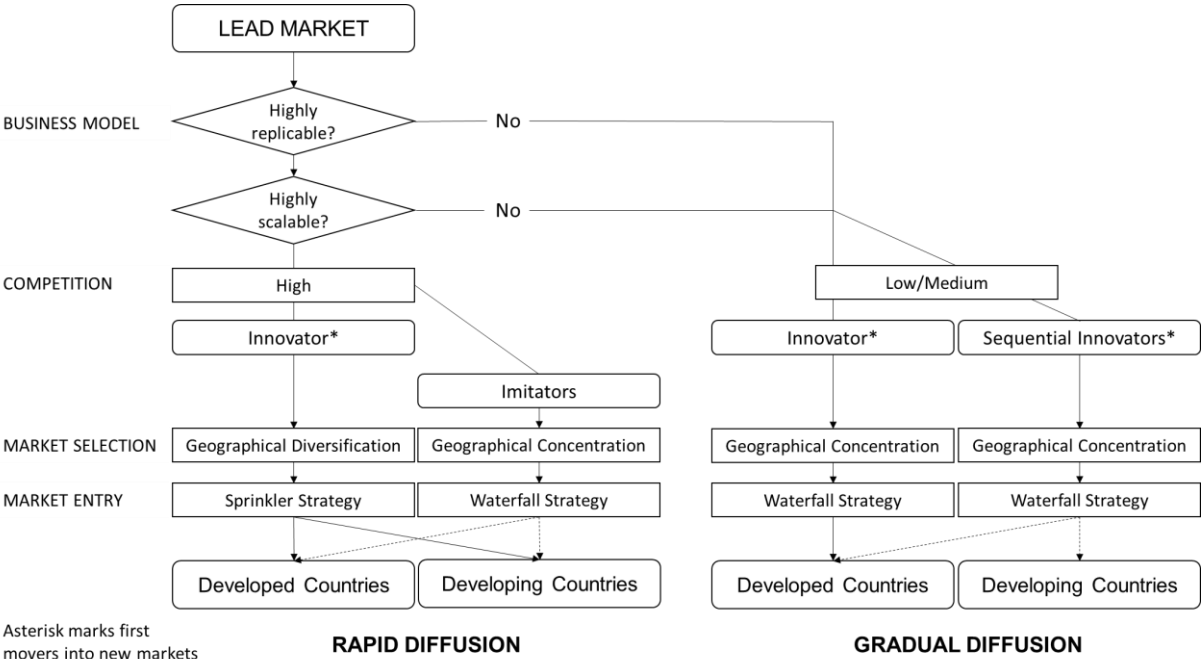


Fig. 7. Diverging diffusion patterns in the mobility ecosystem

6. Conclusion

This research has performed an analysis on the internationalisation of mobility platforms based on multiple cases (ride-hailing, carpooling, and MaaS). The results confirm the a priori advanced Proposition 1 that the rapid or gradual internationalisation of mobility platforms implicate a rapid or gradual diffusion of the respective NMS. Indeed, the type of internationalisation thereby depends on several factors (Proposition 2). Most of all, this relates to the BM. It is the main determining factor that also influences the underlying competition (e.g., successful BMs create increased competition through imitators), the type of expansion strategy, whether markets can be entered as first movers, and, subsequently, whether the NMS diffuses rapidly or gradually. While network effects are essential for the growth of mobility platforms, we found that cross-country network effects do not essentially lead to a faster internationalisation. The results further underline that mobility platforms determine when and where users initially can adopt to a new service by making it available – usually via a mobile app – at the first place. This observation is crucial when trying to anticipate the worldwide diffusion of NMS.

Based on these results, we emphasise that the mobility ecosystem is proving to be very dynamic and mainly driven by the private sector. We further support findings of Ojala et al. (2018) and show that many platforms in this ecosystem are early adopters of internationalisation.

This knowledge is of particular interest in terms of managerial practice, that is, industry decision-makers gain a more comprehensive understanding of mobility platforms' market selection, expansion, and competition strategy. Considering the developments towards multimodal transport including the integration of public and private transport modes, this does not only concern decision-makers from mobility start-ups, but from the entire passenger transport industry including public transport operators, car rental companies, and other incumbent market participants.

The present study highlights the role of developing countries and the interrelations in a global mobility ecosystem that have been rarely discussed in the literature, and thus inaugurates several new research opportunities. Being in its early internationalisation, especially MaaS is a near to unsearched field in the context of developing countries (Hasselwander et al., 2022). Since our analyses only covered NMS that rely on the platform business model, the global diffusion of other mobility solutions, such as bike- and electric scooter-sharing – in which the assets are typically owned by the service providers – also merit additional research.

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