Rethinking on-demand mobility

Turning roadblocks into opportunities

January, 2020

Arthur D Little
Future of mobility lab

Content

Authors:

François-Joseph Van Audenhove
Partner
Travel and Transportation, Brussels
Global Head, Future of Mobility Lab
vanaudenhove.f@adlittle.com

Guillaume Rominger
Manager
Travel and Transportation, Brussels
rominger.guillaume@adlittle.com

Salman Ali
Principal
Strategy & Organization, Madrid
salman.ali@adlittle.com

Joseph Salem
Principal
Travel and Transportation, Middle East
salem.joseph@adlittle.com

Namrata Jaiswal
Consultant
Travel and Transportation, Middle East
jaiswal.namrata@adlittle.com

Yulia Arsenyeva
Manager
Travel and Transportation, Moscow
arsenyeva.yulia@adlittle.com

Lowie D'Hooghe
Business Analyst
Travel and Transportation, Brussels
dhooghe.lowie@adlittle.com

1. Where we stand now

We love them and we hate them. Enabled by ubiquitous connectivity, ever more powerful smartphones, and cloud-hosted applications, private "on-demand" ride-hailing platforms – called transport network companies (TNCs) in the United States – have changed the urban mobility landscape for good. In the space of a decade, companies such as Uber, Lyft and DiDi have become globally recognized brand names and multi-billion-dollar businesses. They started out by targeting young, affluent and digital-savvy consumers but, over time, succeeded in attracting the population at large by providing flexible, fast, door-to-door mobility solutions that were also safer and mostly cheaper. It is not all good news, of course. The onerous working conditions of their drivers have created controversy, and their business model has still to prove its financial sustainability.

Their arrival has also triggered a seismic shift towards shared individual transportation, which has put them on a collision course with the entire individual and public mobility ecosystem. They are threatening the future of traditional mobility solutions (individual cars and public transport) and triggering major market disruption in the conventional taxi sector in many countries around the world. They have the potential to provide an efficient and convenient complementary service to existing mobility solutions in urban areas, however, if not properly regulated, they may also drive up congestion impacting the overall performance of mobility systems.
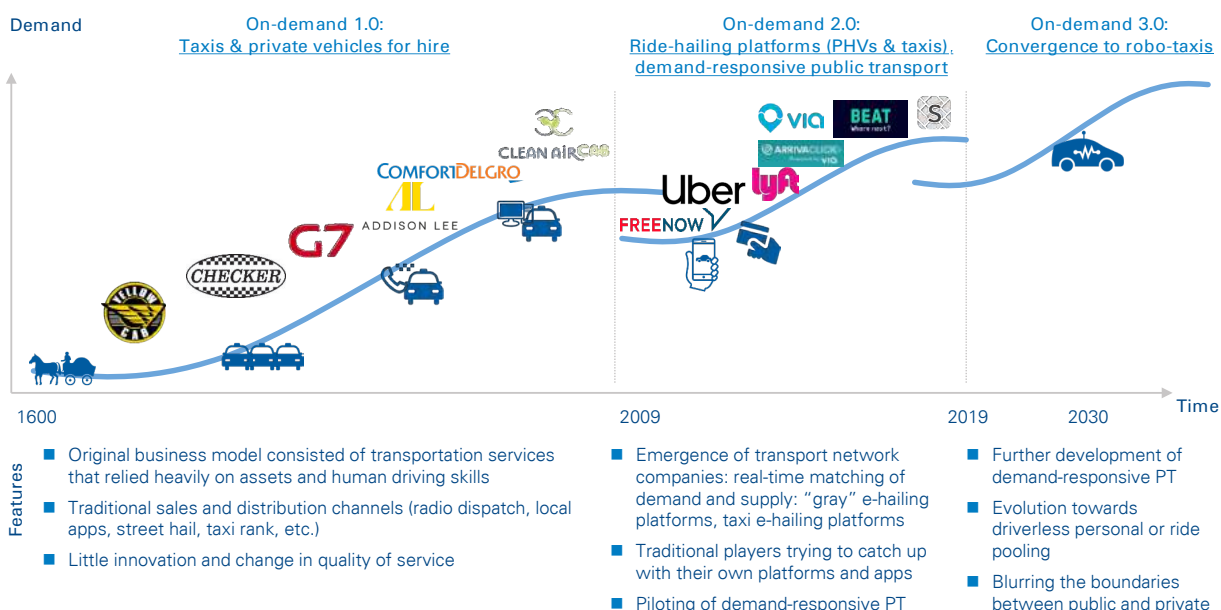
The on-demand mobility sector has been transformed over recent years (See Figure 1). The first generation of on-demand mobility services – conventional taxis, followed by private vehicles for hire – used a business model that relied on the management of both physical assets and human driving skills.

The conjunction of changing customer needs and digitalization, driven by the fourth industrial revolution, triggered the development and rapid deployment of "On-demand 2.0" e-hailing solutions (sometimes also called "ride sourcing"), and thus the emergence of over-the-top actors: ride-hailing platforms.

These operators are establishing a new digital layer connecting private-hire vehicle drivers with passengers requiring rides, on both a pre-arranged and an on-demand basis. Ride-hailing platforms' business models can involve working with private-hire vehicles (PHVs) and drivers, as well as licensed taxis.

Figure 1: On-demand mobility market evolution

Demand

On-demand 1.0: Taxis & private vehicles for hire

On-demand 2.0: Ride-hailing platforms (PHVs & taxis), demand-responsive public transport

On-demand 3.0: Convergence to robo-taxis

1600   2009   2019   2030   Time

Features

- Original business model consisted of transportation services that relied heavily on assets and human driving skills
- Traditional sales and distribution channels (radio dispatch, local apps, street hail, taxi rank, etc.)
- Little innovation and change in quality of service

- Emergence of transport network companies: real-time matching of demand and supply: "gray" e-hailing platforms, taxi e-hailing platforms
- Traditional players trying to catch up with their own platforms and apps
- Piloting of demand-responsive PT

- Further development of demand-responsive PT
- Evolution towards driverless personal or ride pooling
- Blurring the boundaries between public and private

Source: Arthur D. Little analysis

Leveraging data analytics and artificial intelligence, ride-hailing platforms can constantly improve their understanding of customer needs and expectations, and then use this knowledge to upgrade the customer experience. This is done via innovations such as ease of booking through a user-friendly interface, shortened waiting times, pick-up and drop-off visualization, a refined on-board experience, ease of payment. and faster issue resolution. All these elements drive customer preference and loyalty.

"I am looking for a ride to get to my destination"

"I am looking for a luxury ride and willing to pay more"

"I want a ride at this instant and willing to pay more"

"I am okay with sharing my ride to reduce cost"

"I need a good and consistent ride experience"

…

$ Price   🕐 Time   🙂 Experience

… & options to choose

In addition to ride-hailing, major platforms also offer ride-sharing services, such as UberPool and Lyft Shared. These services enable multiple passengers traveling in the same direction to share the same driver and vehicle to their destination(s). While the majority of trips currently provided are ride-hailing, the number of shared trips can be substantial. In 2018 the proportion of shared Uber trips was reported to be above 50 percent in some US cities, although the overall number (across all cities) is estimated to be closer to 10 percent. In the same year, Lyft reported that 35 percent of its US rides were shared, and announced their ambition to reach 50 percent shared rides by 2020. In addition, public transport operators are piloting on-demand shuttle services integrated into their public transport networks.

The demand for on-demand mobility services is expected to soar in the coming years, and their operational margins should improve. Meanwhile, the progressive introduction of self-driving technology and artificial intelligence is expected to further blur the boundaries between public and private mobility solutions through the introduction of self-driving robo-taxis ("On-demand 3.0").

In this context, traditional mobility solutions providers – and especially conventional taxi operators – must reinvent themselves to stay competitive in the short term and relevant in the long term. At the same time, authorities are urged to identify the appropriate regulatory frameworks to enable this new wave of on-demand mobility solutions so they can cater for the needs of consumers while striving for the system optimum.

If not managed adequately, this level of disruption in the highly regulated world of mobility could lead to all-out "war". However, if handled wisely, it could result in a new kind of peace in the troubled mobility playing field. Either way, it won't happen by itself.

2. Market and regulatory outlook

2.1 General market outlook

E-hailing solutions (ride-hailing platforms) are omnipresent in most geographic areas. Although they still only represent a small percentage of the trips traveled in cities – ride-hailing trips are reported to represent only about 1 percent of the overall number of kilometers traveled in the world – they are expected to grow rapidly and have an increasing impact on urban mobility systems as users warm to the new paradigm. In recent years, e-hailing has been growing much faster than other shared mobility concepts, such as car sharing, bike sharing, and carpooling.

However, as with other shared mobility concepts, e-hailing is heavily influenced by local regulation; this has prevented even the biggest ride-hailing platforms from scaling up to build global presence, and allowed several regional heavyweight players to emerge.

Today's ride-hailing platforms tend to be based on one of two main business models, or a combination:

- The best-known category of ride-hailing platforms is so-called transport network companies (TNCs) – Uber, Lyft and Cabify. They predominantly work with drivers who use their own (non-commercial) vehicles. These companies are sometimes dubbed "gray TNCs" due to the initial "gray" nature of regulations applied to them, although recent regulatory evolution has made this description less appropriate.

- Another category is "taxi ride-hailing platforms" (including Free Now in most countries, LeCab, and Gett). These operators contract licensed taxi companies and drivers to serve in their fleets. This strategy leverages existing cars and drivers, and thereby circumvents the question of which labor laws apply to them and any problems associated with acquiring operating licenses. It also reduces potential strains with traditional taxi companies in the same market. Other examples of taxi ride-hailing platforms include Taxi.EU and Vezet.

- More recently, we have seen the emergence of ride-hailing platforms that combine both operating models. They either complement PHV-based ride-hailing platforms with taxi ride-hailing platforms or acquire traditional taxi companies. In July 2019, for example, Yandex Taxi – the ride-hailing platform joint-venture set up by Uber with Russian search giant Yandex – agreed to buy Russia's largest taxi company, Vezyot, thereby drastically increasing its share of the Russian on-demand market. This mixed model allows PHV-baed ride-hailing platforms to adapt their business models to local specifics. This way they can operate legally in markets from which they would otherwise be barred, and even offer two options to customers in the same market at the same time (e.g., Free Now Ride, CleverGO, Ola , Bolt).

In some cases, ride-hailing platforms also develop partnerships or collaborate actively with public transport authorities or operators to offer services that complement, or even partly replace, public transport. These joint services offer "demand responsive public transport" (DRPT) on special routes or at certain times of day. In recent years, several public transport operators have initiated DRPT pilot projects operated by their own staff. This approach could pave the way towards on-demand, self-driving public transport. The genre is expected to grow in popularity over the next few years. DRPT can be a relevant solution when traditional public transport (with its high fixed and running costs) is in less demand due to a small population, unconventional traveling times, a large area to be covered, or all of these.

Today, the e-hailing market is only one-third the size of the global taxi market, and was estimated to be worth 61 billion USD in 2017[1]. Over 16 million e-hailing trips[2] take place daily across the globe (6 billion trips per year). By 2030, this total is projected to increase to around 83 billion trips[2]. Recent studies predict a growth CAGR ranging from 15 to 28 percent, which will lead to an increase in market size to 285 billion USD by 2030. This exponential growth will be driven by a lower rate of car ownership among millennials and the expected progressive integration of ride-hailing into other shared mobility solutions. Such shared mobility solutions include car sharing, bike sharing, micro-mobility, and the future development of mobility-as-a-service platforms, which are expected to increase appetite for on-demand mobility solutions.

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1   MarketandMarkets, Ride Sharing Market, Global Forecast to 2025, June 2019
2   Goldman Sachs, "Rethinking mobility: The pay as you go car", 2017; Market & Market
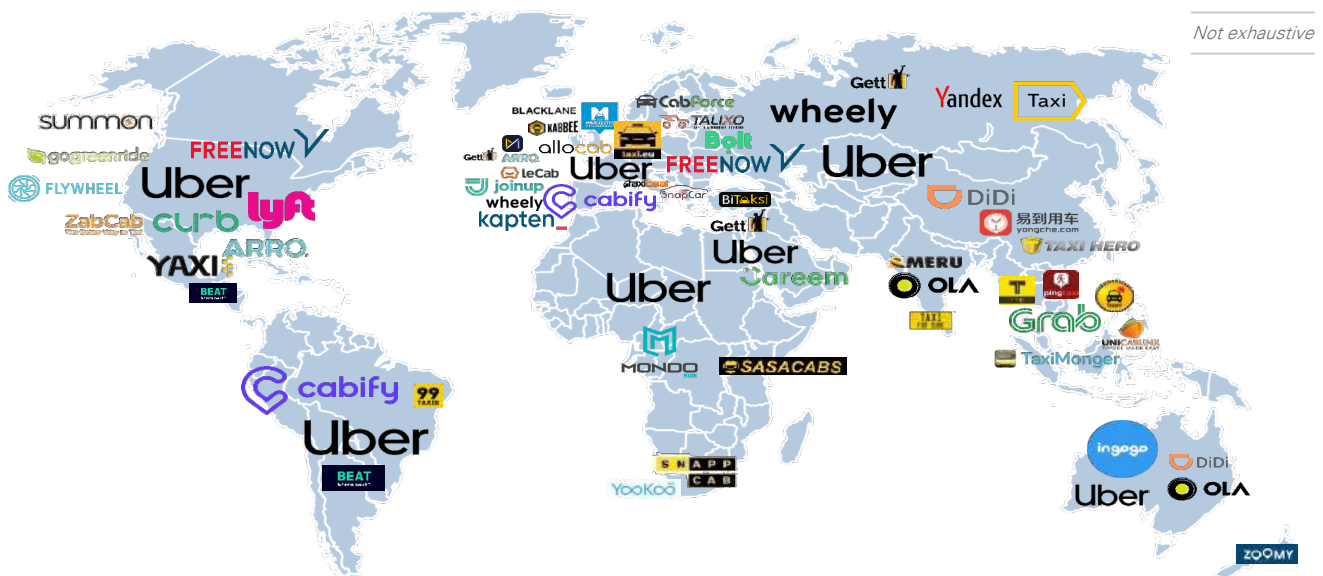
Arthur D Little

2.2 Industry outline

In their efforts to expand internationally, global players in the e-hailing market are often hindered by the nature of traditional on-demand ecosystems and the complexity of local regulations. As a result, the e-hailing market remains fragmented, with industry giants often competing with regional heavyweights and local niche players:

■ The North American market is where the first successful TNCs were founded and where the most innovative business models and application features are usually introduced before they are deployed in other markets. Uber and Lyft – both headquartered in San Francisco – have an effective duopoly, with a market share of over 90 percent. Other ride-hailing platforms have entered the market, such as Bolt (formerly Taxify, originating from Estonia) and Gett (originating from Israel, following the acquisition of Juno). However, these players remain relatively small.

■ South America is a fragmented market, with many local players operating in one city or a limited number of them. This market is considered to have significant growth potential due to its increasing population and relatively low incidence of personal car ownership. Apart from a number of small, local players, most e-hailing business is done by big brands such as Uber, Didi (through the Brazilian e-hailing app 99), Free Now (which grew out of the merger of Mytaxi, Clever Taxi, Beat and Kapten) and Cabify (which originated in Spain).

■ The European e-hailing sector is a crowded market made up not only of international ride-hailing platforms, but also a large number of start-ups that entered the market in recent years. Due to high disposable incomes, an advanced level of digitalization, and ever-tightening regulations on

the use of personal cars in city centers, Europe is home to some of the world's most active cities for e-hailing, which include London, Paris and Berlin. However, variations in the regulatory framework between cities – and regular "changes of gears" in terms of regulation – have made it difficult for ride-hailing platforms to expand quickly in Europe. This factor also partly explains why "taxi ride-hailing platforms" are more abundant in Europe than in most other regions of the world.

■ Africa, like South America, presents major opportunities for ride-hailing platforms due to strong economic and demographic growth, as well as relatively low penetration of personal cars. The high rate of mobile phone ownership and availability of efficient payment mechanisms, such as M-Pesa, also make it an attractive market. At the same time, it is the most fragmented region, with little penetration of large ride-hailing platforms in, for example, Sub-Saharan Africa. Countries such as Kenya and Tanzania house a number of emerging ride-hailing platforms that have started to develop presence in multiple cities, but there is still a long way to go in terms of funding, regulatory and political stability, etc., before real "regional heavyweights" emerge.

■ The Asian region contains a number of high-growth/high-potential markets, such as China, Russia, India and Indonesia. In China, DiDi Chuxing is the clear winner after acquiring Uber's local operations. A similar scenario has played out in Russia, where Yandex.Taxi enjoys market leadership after acquiring Uber's operations in the country. A peculiarity of the Russian market is that, even though app-based platforms have been developed, a substantial percentage of e-hailing bookings are still done over the phone.

Figure 2:   Overview of transport network companies by region

Not exhaustive

Source: Companies' public filings, Arthur D. Little analysis

- In India, Uber and local giant Ola are in a duopoly, with over 90 percent of the market between them. A remarkable fact is that Ola and Uber have a major shareholder in common – SoftBank, which is effectively funding the competitive struggle between them. Ola currently has the edge over Uber, with more cities served, a higher number of drivers, and more rides completed. However, while India is an attractive market due to strong economic and demographic growth, events may well unfold in a similar manner to the way they did in China and Russia, with one of the two major players leaving the market.

- In Southeast Asia, Uber has sold its operations to local heavyweight Grab. The Singapore-based ride-hailing platform is active in eight countries and 170 cities, and thus a key player in the region. With the backing of big names such as SoftBank and Temasek, car OEMs Honda and Toyota, and even other ride-hailing platforms such as DiDi, Grab has a significant market share. Only one other player, Go-Jek – backed by Google, Tencent and Temasek – has a significant position in the region.

As Figure 3 shows, none of the world's largest ride-hailing platforms are more than 10 years old, which clearly illustrates the "get big fast" strategy they have been following. In order for a ride-hailing platform to be profitable and sustainable in the longer term (see more on this topic later in this report), significant scale is needed, as the e-hailing business model relies on a network effect. However, this quest for growth leads to fierce competition among players in the same regions. Pricing by ride-hailing platforms tends to be very competitive, and discounts are often given to users to gain market share. At the same time, some ride-hailing platforms offer additional benefits

or even cash bonuses to attract new drivers. These aggressive growth strategies require large amounts of liquidity due to the high "cash-burn".

This highly competitive environment and associated need for cash to meet customer (and driver) acquisition costs takes its toll on even the largest ride-hailing platforms. This has led some of them to make the strategic decision not to compete in particular markets, so they can conserve cash for countries where the chances of market domination are higher. In this context, Uber has already sold its operations in China to DiDi, its Russian business to Yandex.Taxi (through a joint venture) and its Southeast Asian activities to Grab.

Another option is for companies to buy local ride-hailing platforms instead of entering certain markets themselves; in this way, they avoid a costly war between competitors. Uber is not directly active in all markets, but has a significant share in major ride-hailing platforms in the areas where it is not present (e.g., DiDi, Grab, Yandex.Taxi). To get a foothold in South America, DiDi bought the 99 app instead of launching its own platform. This type of strategic move can make a lot of sense in the "fight for market growth", as indigenous players have invariably adapted to local regulations and culture. In the coming years, we expect consolidations among ride-hailing platforms to continue, including between larger players. This trend is illustrated by the announced acquisition of Careem, by Uber, although competition authorities in multiple countries are threatening to block the merger. Meanwhile, numerous new players are expected to emerge, trying to position themselves in their markets through innovative business models and differentiated service offerings.

Figure 3:   Description of key global and regional ride-hailing platform

	Uber	Lyft	Cabify	DiDi	Careem	Grab	FREE NOW	OLA	Yandex Taxi	
Year of foundation	2009	2012	2011	2012	2012	2012	2009 (formerly MyTaxi, Hailo)	2011	2011	50+ other players globally
Key shareholders	■ SoftBank Corp (16%) ■ IPO in May 2019	■ Public IPO in 2019	■ Rakuten	■ Alibaba ■ Tencent ■ Baidu	■ Uber (acquired in March 2019)	■ Temasek Holdings ■ SoftBank Corp	■ BMW Group ■ Daimler AG	■ SoftBank Corp	■ Yandex	
HQ	US	US	Spain	China	UAE	Singapore	Germany	India	Russia	
Main offerings/ business model	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform" ■ DRPT	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform"	■ "PHV ride-hailing platform"	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform" ■ DRPT	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform"	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform"	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform"	■ "PHV ride-hailing platform"	■ "PHV ride-hailing platform" ■ "taxi ride-hailing platform"	Bolt Gett
Number of cities	63 countries >700 cities	2 countries >660 cities	12 countries >130 cities	>400 cities in China >1,000 cities globally via partnerships	>14 countries >90 cities	>500 cities in Southeast Asia	>100 cities in Europe	4 countries >150 cities	18 countries >300 cities	
Est. fleet size	93 million active users	2 million drivers	Hundreds of thousands of drivers	>550 million users >31 million drivers	>30 million users >1 million drivers	>45 million users >1 million drivers	>21 million users >250,000 drivers	>1.5 million vehicles	>200,000 drivers	

Source: Arthur D. Little analysis

While they are in need of fresh cash to finance their expansions and secure the required technological development to drive differentiation in competitive markets, ride-hailing platforms are nevertheless considered attractive investment targets by numerous actors both inside and outside the mobility space. This is thanks to the high expectations of the "new mobility paradigm" and positive market outlook for on-demand mobility solutions:

■ Technology conglomerates are natural partners for ride-hailing platforms since they can contribute to the technological development (software and data management) necessary for ride-hailing platforms to improve their operations, differentiating their offerings and pursuing the goal of "autonomous on-demand mobility" (robo-taxis). Several technology conglomerates that have invested in ride-hailing platforms (e.g., Alphabet Inc., Tencent, Alibaba, Yandex, Rakuten) are developing self-driving technology.

■ Financial conglomerates such as Temasek Holdings and SoftBank represent a second significant type of investor in ride-hailing platforms. In some cases, as we have seen, an investor backs two direct competitors, effectively funding reactions between these players. The strategy here appears to be aimed at growing the valuation as much as possible pre-IPO, before going to the stock market and betting on the long-term profitability of the business model through future market consolidation and development of additional services.
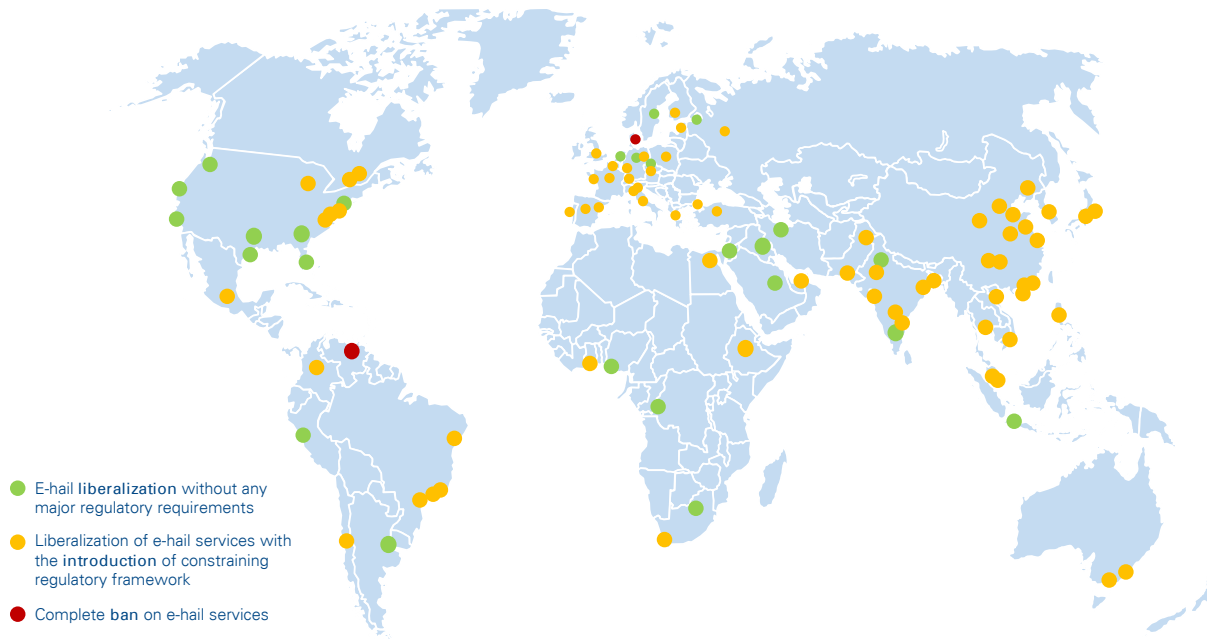
■ Car OEMs, meanwhile, have been involved in funding rounds and strategic partnerships with multiple leading ride-hailing platforms. A good example is Daimler, which is partnering with BMW to provide mobility-related services, partly through Free Now (formerly MyTaxi). Other examples are VW group's investment in Gett, General Motors' share in Lyft, and Toyota's stake in Grab, Uber and DiDi. Car OEMs realize the need to be part of the "new mobility ecosystem", partly through developing their own solutions and partly through investing in future mobility platforms and solutions, which will allow them to keep ownership of future distribution channels.

2.3   Regulatory outlook

The rapid growth and proliferation of e-hailing services in major cities across the globe has prompted authorities to adapt regulations in order to better absorb this new concept into their overall mobility systems, sometimes with frequent "changes of gears" over short periods. The challenge for ride-hailing platforms in this situation is to keep abreast of regulation in a fast-changing environment, although this includes a high degree of variation between regions and cities.

Overall, in Europe most of the biggest cities have adopted regulatory frameworks for PHV e-hailing activities, while spots for liberalized markets remain available in the Americas, Africa and the Middle East (Figure 4).

Figure 4:   Overview of regulatory pressure on e-hailing services in major cities across the globe

● E-hail **liberalization** without any major regulatory requirements

● Liberalization of e-hail services with the **introduction** of constraining regulatory framework

● Complete **ban** on e-hail services

Source: Arthur D. Little analysis

- In cities such as Copenhagen and Caracas, e-hailing services are currently illegal. Greece, meanwhile, has imposed strict regulations that designate specific starting and ending points for trips, and mandates a digital registry for all ride-sharing platforms. This has proved too onerous for Uber, which eventually suspended its licensed service (UberX). With the aim of protecting the business models of traditional taxi companies, some cities – such as Brussels and Rome – have developed very restrictive regulations towards e-hailers (e.g., in terms of technical specifications for private hire vehicles and minimum purchase prices or trip durations). This has made it very difficult to efficiently operate in those cities.

- At the other end of the spectrum, some cities have welcomed ride-hailing platforms without any major updates to the associated regulatory frameworks. The Saudi Arabian government, for example, has been encouraging and investing in e-hailing companies in anticipation of their impact on job creation. As of February 2018, there were 20 licensed ride-hailing apps running in Saudi Arabia. Among European cities, Paris, Stockholm, Moscow and Warsaw stand out as highly liberalized markets for private-hire vehicles and e-hailing operators.

- In between, a large number of cities have taken a more balanced approach: allowing e-hailers to operate, while framing their development through specific regulations. London is one of the most prominent examples of this approach. While there is no restriction on the number of vehicles, there are strict regulations in terms of licenses (for the e-hailers themselves, as well as for vehicles and drivers). These include an extensive list of qualitative requirements to secure services that are safe, convenient and transparent, and meet the necessary quality standards. That being said, it can be questioned how much of this was a premeditated strategy by the London authorities, and how much was a direct response to events as they emerged. New York is another good example. It has capped the number of e-hailers, set minimum wages for drivers, and made it a condition of licensing for a new for-hire vehicle to be wheelchair accessible. More recently, New York extended its cap on the number of TNC vehicles by making them subject to penalties if they did not have passengers on board at least 69 percent of the time while operating in Manhattan below 96th street. (Uber has been contesting this new regulation in court). The city also announced more regulations.

From a mobility system point a view, it is not advisable to completely ban e-hailing services or impose measures so restrictive that they constrain the development of the e-hailing market. This approach usually leads to under-served market demand, higher prices, and lower quality than in a fully competitive market. Coupled with absence of measures aimed at reducing the total number of private cars, this can worsen traffic congestion since under-served demand for convenient mobility solutions pushes people to use their own cars more frequently. Full liberalization, on the other hand, also has its downsides. Although it helps foster innovation and contribute to job creation, it might well erode margins for the industry as a whole due to market over-saturation (as witnessed in Warsaw). In the absence of limitations, it could lead to overall price increases and reduced market transparency (as reported in Stockholm and Amsterdam).

As further elaborated on in Section 4, regulation of new forms of mobility – e-hailing in particular – is all about finding the right balance between the interests of the various stakeholders. This involves finding a middle ground between the framework that regulates the ride-hailing platforms – smart regulation uses a "test and learn" approach as required – and "enabling" e-hailing market development by establishing the right vision, infrastructure and incentives. All of this will drive innovation, to the benefit of the public at large.

3. Challenges and opportunities for on-demand mobility solutions providers

3.1 Challenges and opportunities for ride-hailing platforms

The use of new technologies and digitalized platforms/business models, coupled with better understanding of customer expectations, allows e-hailing companies to aim for both efficiency gains and a superior user experience. This is achieved through focus on the "service intense" part of the value chain, leaving the accountability to third parties for asset-intensive parts.

Indeed, the main competitive advantages of ride-hailing platforms over traditional taxi operators' radio dispatch centers come from allocative, cost and pricing efficiencies:

- **Allocative efficiencies:** Efficiency gains come from dispatching the optimal vehicle for the customer's location and trip request, thereby replacing the advance-booking system inherent to traditional methods, such as radio dispatch and street hailing. Ride-hailing platforms allow for immediate, fully automated collection of data points from drivers' smartphones. Traditionally, drivers had to decline bookings which were scheduled too close to other future commitments, but on-demand platforms now allow for continuous shifting and adjustments of bookings. This decreases waiting times for drivers and passengers simultaneously. Additionally, digital booking platforms can offer transportation services that would have otherwise required high resource commitment and therefore not been economically viable for service providers. For example, beyond its standard services, Uber provides UberPool and Free Now offers Free Now Match, which use the dispatch platform to identify two or more passengers with similar

mobility patterns who could combine their travel bookings in the form of ride sharing.

- **Cost efficiencies:** E-hailing companies boost cost efficiencies by replacing non-digital dispatch centers and analog in-car equipment (i.e., radio communication units and credit card machines for payment) with less costly and more user-friendly smartphone- and/or web-based applications. Moreover, given that traditional dispatch is based on limited information about customers and drivers, a passenger might not be matched with the most efficient transportation provider, which would delay the driver's arrival to the customer. Digital platforms lower these costs by finding the most suitable transaction counterparts via matching algorithms. They also simultaneously eliminate human errors and potential bias.

- **Pricing efficiencies:** Pricing efficiencies originate from both supply and demand responses. Real-time information on external market conditions and dynamic pricing models allow ride-hailing platforms to dynamically adjust prices as the market equilibrium of supply and demand evolve (known as "surge pricing"). In times of peak demand, higher prices motivate drivers to join the platform, thereby creating a bigger fleet. On the other hand, flexible passengers might shift trips to times with lower demand and benefit from decreased prices (known as "peak shaving"). This practice is however only possible if regulation permits it. While surge pricing is a relatively common practice worldwide for PHV-based ride-hailing platforms, regulation in several countries – especially in Europe – currently does not allow this practice to be applied for taxi-based ride hailing platforms.

Figure 5: On-demand mobility value chain
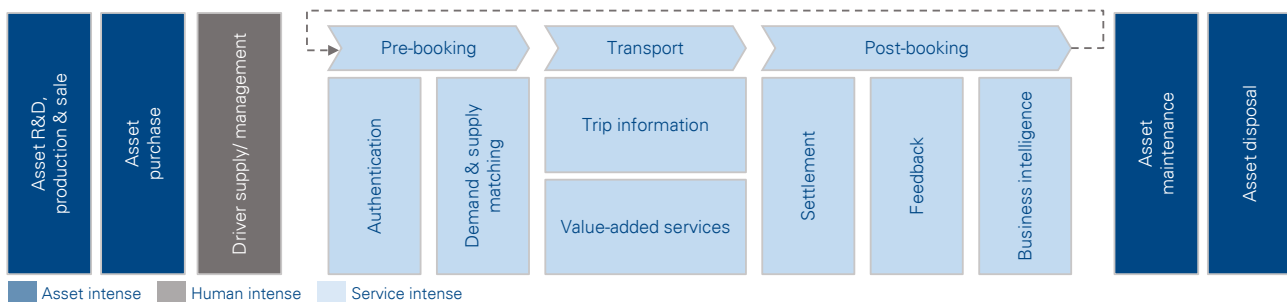
Source: Arthur D. Little analysis

Figure 6:   Simplified economics of PHV ride-hailing platforms (€/trip)

Assuming:
- 10 km ride
- 17 min avg. time
- Taxi pricing: €1.1/km plus €2.4 initial fee
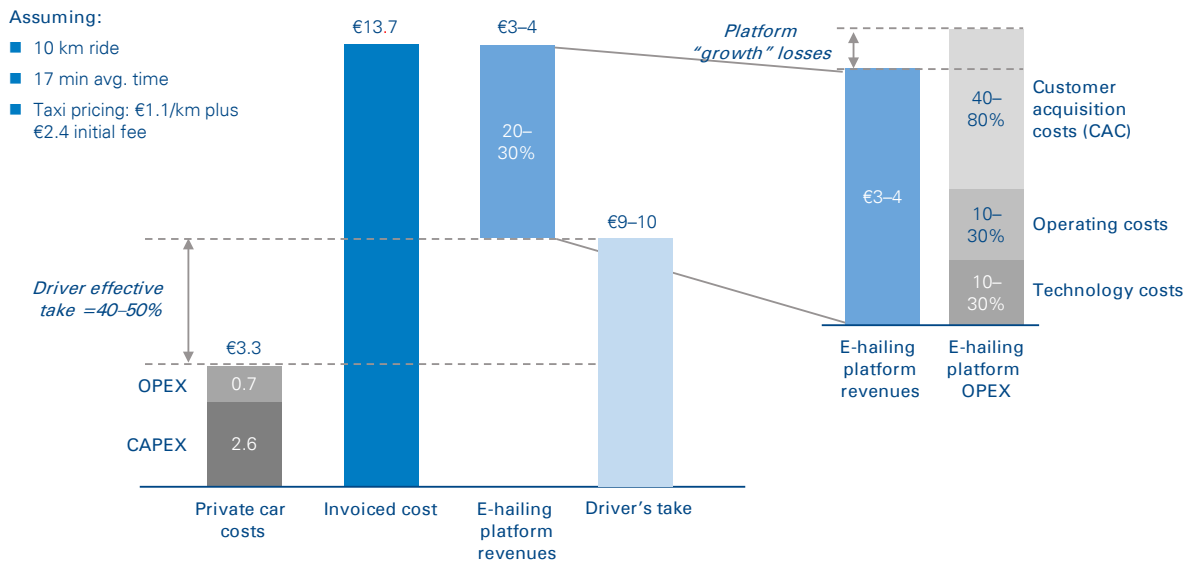
Source: Arthur D. Little analysis

That said, most ride-hailing platforms currently remain unprofitable. Major e-hailing companies subsidize each trip to provide competitive rates to passengers, while, at the same time, making substantial investments in driver and customer acquisition to increase volume and market share (See Figure 6). In August 2019, Uber reported its largest-ever loss, of $5.2 billion, for the second quarter of 2018 (or $1.3 billion, excluding one-time expenses caused by the stock-based compensation that Uber paid its employees after its IPO). Lyft has also reported a series of heavy losses, including a deficit of $644 million in the second quarter of 2019. In the long term, the business model of ride-hailing platforms is expected to be profitable. However, due to significant investments to scale and acquire new customers, the current business case is not balanced and can only be considered transitionary.

The economics of "taxi ride-hailing platforms" are different, as customer-acquisition costs are lower because they are working in partnership with traditional taxi companies that already have customer bases. On the other hand, revenues are limited because the platform is taking a much lower percentage of the transport income. Taxi ride-hailing platforms typically take a 10–15 percent fee per trip (as opposed to 20–30 percent with PHV ride-hailing platforms), while the remaining revenue is kept by the traditional taxi operator. The competitiveness of this business model is dependent on its ability to compete on price and services with PHV ride-hailing platforms, while bearing higher operational costs. The key levers for PHV ride-hailing platforms to maintain sustainable business models over time are thus heavily linked with securing a level playing field between traditional taxi operators and PHV ride-hailing platforms.

Moving forward, development of robo-taxis as an alternative to human-operated solutions could dramatically reduce the cost to serve and allow e-hailing platforms to claim a much larger share of profit in the absence of driver fees. However, this revolution is not expected to arrive within the next five years, and if the forecasted growth in the demand for e-hailing materializes, ride-hailing platforms will need to make changes to develop profit-generating business models in the medium term. This situation becomes even more true as major ride-hailing platforms (such as Lyft and Uber) aim to become publicly quoted companies[3] and investors increasingly scrutinize their performances.

As mentioned before, the current business case for most ride-hailing platforms is not profitable, due to significant development (to build scale) and customer acquisition costs. Regulation is another critical factor influencing profitability, especially in terms of creating a level playing field between TNCs, taxi ride-hailing platforms and traditional taxi companies. In addition to these, a number of different levers can be utilized to improve the positioning of ride-hailing platforms and develop a profitable business model. Here are a few:

- Build better understanding of local mobility needs in key cities where the company operates – understanding local needs is an area where ride-hailing platforms historically have had deficits versus conventional taxi providers – as a basis for developing more tailored value propositions (fare tariffs) and loyalty programs. To improve its performance in this area, Uber introduced the position of "head of cities" as a critical new function in its organization. Uber's head of cities (a role typically spanning one or more countries) serves as an interface between Uber and its key stakeholders in

3   Lyft's and Uber Technologies' initial public offerings were realized on March 29th and May 9th 2019, respectively

cities (i.e., regulators, government officials, members of the business community, academia, and not-for-profits). They play a critical role in developing and nurturing critical relationships to raise Uber's profile and shift perceptions of key stakeholders to support faster growth.

- Assess opportunities to collaborate with public transit authorities and operators to complement their offerings, either to supplement the first and last mile, or to provide alternative solutions when public transit is not available. This topic is further developed in section 3.3.

- Assess partnership opportunities with public transit authorities and operators, as well as other "new mobility" solutions providers (car sharing, bike sharing and micro-mobility, as well as public or private MaaS operators) to integrate them into the company's own platform. Alternatively – as many major players, such as Uber and Lyft, have already done – partnerships can be used to extend the company's own offering into other mobility solutions. In November 2019, Free Now announced its transition towards a multi-modal service provider (MaaS), integrating solutions such as car sharing, bike sharing and public transport into its app. Uber launched Uber Transit in Denver in partnership with the city authorities there. A similar scheme was recently introduced in Sydney; it gives Uber users real-time transit information and allows them to choose the fastest routes and select mobility options from public transport, bike, scooter and Uber ride. "Nearby Transit" is a similar new application feature rolled out by Lyft across several cities in the US. Also in the US, Lyft has partnered with Scoop, a carpooling service, to provide Scoop users with guaranteed rides home in case carpooling options are not available. Uber established a similar partnership with Klaxit.

- Develop customer preference through deployment of loyalty programs. Uber and Lyft have both developed rewards programs with multiple levels – determined by the number of points collected – and a variety of incentives. Participants in the Uber rewards program (now available to all riders in the US) will have the opportunity to spend their points on priority pickups at airports and free deliveries via Uber Eats.

- Assess opportunities to drive customer loyalty through a subscription model. In late 2018, Lyft launched its all-access subscription plan across the US. The plan cost USD 299 per month for 30 rides of up to USD 15 each (if a ride cost over USD 15, the user would pay the difference, and if they took over 30 rides, the additional rides would be discounted at 5 percent). Around the same period, Uber launched "Ride Pass", a monthly subscription offering, across several US cities. Users would pay USD 14.99 a month to lock in flat fares for unlimited rides. Building on this positive experience, Uber is currently testing a monthly subscription plan in

Chicago and San Francisco, which, for a monthly fee of USD 25, would give users access to discounted rides, free Uber Eats food delivery, and free JUMP bike and scooter rides.

- Diversify the customer base through innovative offerings, caring for the needs and driving preferences of specific customer segments, such as businesses (B2B or B2G), environmental enthusiasts, and customers with lower incomes. In Washington, Via (the world's largest operator of demand responsive transport) partnered with the government to provide e-hailing rides to employees on official business. Lyft has recently launched "Green Mode" in Seattle, which allows users to request rides from fully electric or hybrid vehicles. To support Green Mode, drivers can rent electric vehicles through Lyft's Express Drive Platform, which provides unlimited charging. Similarly, Free Now offers different fleet types, such as eco, extra-large, and pet-friendly taxis. InDriver, a Russian ride-hailing platform, has recently launched in the US with an innovative pricing model that allows riders and drivers to negotiate over-ride fares. Ola, a ride-hailing platform in India, recently introduced Ola Money Postpaid, a credit service that permits customers to accumulate ride charges and then pay for 15 days of rides at one time, without incurring additional charges.

- Further develop ride-sharing offerings, including more advanced data analytics, use of artificial intelligence to improve demand prediction, and improvements in convenience of shared commutes. Uber Express POOL, now available in several US cities, matches riders traveling along similar routes and, in return for requiring them to walk a few blocks from their origins or to their destinations, discounts the price of an equivalent UberPool ride by 30–50 percent.

- Find ways to improve the ride-sharing experience by making trips more comfortable and convenient. Uber recently introduced an "Uber Comfort" feature in dozens of cities across the US. For a price 20–40 percent higher than that of UberX, users of Uber Comfort travel in vehicles that are no more than five years old and have minimum legroom of three feet. They can also request quiet time and their ideal temperature in advance, as well as extra time before getting into the car to avoid late pick-up fees. Furthermore, the physical design of vehicles could be improved, which would make them convenient for a wider range of trip purposes. For example, the company could maximize space for shopping and goods deliveries, allow for set-ups that better accommodate specific social or business needs, and seat multiple passengers.

- Assess the potential for smartly increasing prices in selected customer segments (i.e., through upselling of additional services into more comprehensive solutions) to increase

their cost-coverage ratio. Several studies have found that the number-one reason existing ride-hailing users choose it over other transport modes is convenience (not price). This should give room to maneuver for ride-hailing platforms, as long as additional conveniences can be provided.

- Develop ancillary revenues by offering new services in adjacent markets that do not involve transportation of people. Several e-hailers have launched food delivery services using their existing rider bases, drivers and payment mechanisms. Grab launched GrabFresh in Indonesia and Bolt launched a similar service in Europe and South Africa. Another option is to create a distinct solution, as Uber has done with Uber Eats. Other examples include Lyft's vehicle-rental service in San Francisco and Grab's joint-venture with Ping, an online healthcare service provider, to deliver healthcare products. Uber also recently announced a plan to apply its on-demand model to the shipping industry through a program called Uber Freight. This aims to connect carriers with the most appropriate shipments available, while providing them with upfront, transparent pricing and the ability to book shipments at "the touch of a button."

- Seek to smartly adapt contractual agreements with drivers to improve predictability of revenues, while keeping flexibility. This will help to attract more drivers and retain them once they have signed up. This should significantly improve the economics of the business in the long run, given the predicted growth in market demand. Several players have launched dedicated driver-training and development programs, as well as incentive schemes. A good example is Uber's EV champion initiative, a pilot program to incentivize its drivers to use EVs or plug-in hybrids. The initiative gives drivers monetary subsidies and educational programs in return. Lyft's partnership with Avis provides on-demand Avis car rentals to Lyft drivers at preferential rates so people can become Lyft drivers without the cost and burden of car ownership.

In addition, ride-hailing platforms must come up with appropriate industrial strategies to ensure they are ready, together with selected partners, for the future development of self-driven "robo-taxis"[4]. It is still expected to be some time before such solutions are deployed in city centers and elsewhere, but they will constitute a true "game changer" in the economics of on-demand transport solutions. Given this, the concept of the robo-taxi has to be kept under scrutiny. It is important to identify partners capable of developing such services, and be prepared to invest in the future. Current autonomous technology projects being undertaken by ride-hailing platforms are thus long-term investments, and the future business model is not

yet clear, given the difficulties with managing the transition to autonomous driving. However, some initiatives are underway, which indicates that ride-hailing platforms (and other players, such as Waymo) are taking autonomous driving seriously. For example, Uber has operated autonomous vehicles in Pittsburgh, and started mapping data in Dallas in September 2019. Meanwhile, Waymo, a Google spin-off, is also mapping data and expanding its geographical coverage – now in Los Angeles as of October 2019. Outside the US, ride-hailing platforms are also moving ahead with autonomous technology development. DiDi Chuxing, for instance, has split off its autonomous driving division to allow for greater flexibility so it can increase investment and geographical coverage.

3.2   Challenges and opportunities for traditional taxi companies

Conventional taxi companies are under pressure. They need to reinvent themselves to survive in the "new mobility" ecosystem, regain market share, and stay relevant in the long term. This can be done via internal transformation and/or partnering with ride-hailing platform.

An internal transformation can be costly, as it requires investment in technology and building new capabilities, such as marketing, data analytics and customer experience. However, it can provide a good return on investment in the long run if properly executed. Traditional taxi companies can use a number of different levers to drive internal transformation:

- One of ride-hailing platforms' main strengths is their advanced technology. Therefore, installing a system that allows customers to plan, book and pay for their rides through an online application on their smartphones is a prerequisite for traditional taxi companies looking to compete with these platforms. This can be done through internal development, via acquisition of a white-label solution from an "on-demand solution provider company", or under a licensing or software-as-a-service (SaaS) agreement.

- Once they have developed their own platforms and applications, traditional taxi companies should assess partnership opportunities with "new mobility" solution providers – operators of car-sharing, bike-sharing and micro-mobility services – with a view to integrating them into their own platforms as complementary services to their taxi offerings. Alternatively, traditional taxi companies could assess the opportunity to extend their own service repertoires by offering other mobility solutions.

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4   For more insights and information, see Arthur D. Little's publication, "The march of the robo-taxis", 2019

- Traditional taxi companies should work at improving the attractiveness of their commercial offerings to increase customer loyalty and "stickiness", as well as drive differentiation versus PHVs. This can be done by:
    – Further developing differentiated value propositions (tariffs and pricing schemes) and building on their understanding of local mobility needs, including development of ride-sharing offerings.
    – Developing loyalty programs tailored to local customer needs.
    – Collaborating with cities and (public and private) MaaS platform operators to integrate themselves into emerging MaaS offerings, and thus benefit from increased addressable customer bases – all without any customer acquisition costs.
    – Collaborating with public transport companies to complement their offerings, by covering "the first and last miles" or providing complementary services when public transit is not available.

- Traditional taxi companies must work on improving their service levels and customer experience by, for instance, investing in training programs to boost driver-service levels or updating their car-maintenance programs to provide increased customer comfort.

As an alternative to internal transformations – or to complement them – traditional taxi companies could form partnership arrangements with taxi e-hailing platforms, under which the taxi company would own and operate the fleet, while the e-hail player would provide the services around it – such as user authentication, demand-supply matching, value-added services, a payment system, and feedback and business intelligence. This approach optimizes taxi companies' existing capabilities and requires relatively less investment than the full internal transformation option.

The decision of whether internal transformation or partnership is the best strategy for a particular company will arise out of an assessment of the existing business. This assessment will take into account its current position in the market – as well as its fleet size and reach – investment capabilities, level of agility and flexibility, appetite for risk, and willingness to embark in this new journey.

3.3 Implications and opportunities for public transit

The move towards on-demand mobility is undoubtedly a key feature of future mobility systems. Transit operators and authorities should bear this issue in mind as they seek to develop efficient mobility systems with mass transit as a backbone. On-demand public transit has been with us for decades in the form of services for individuals with disabilities. These have been inherently inefficient due to the time needed to attend to the special needs of these passengers, but technological advances are now providing opportunities to revisit on-demand transit. DRPT solutions allow us to efficiently serve areas of low demand at times of low demand.

Two questions are commonly raised with regard to on-demand mobility solutions and their integration into traditional mobility systems:

- Will they be integrated with other modes?
- Can they harmoniously blend and complement traditional mobility solutions?

The first question is becoming increasingly redundant. Integration of traditional public transit with new, on-demand transport solutions through journey planning is a trend already witnessed across the world. When not driven by on-demand players themselves, integration is often provided by third-party journey planners such as Citymapper and Moovit. However, integration is not limited to journey planning. Both public and private players are developing MaaS platforms that combine public transit and on-demand mobility solutions, as well as a variety of other mobility solutions, to the benefit of customers. Among private-led initiatives is Uber's integration of public transport (plan, book and pay) in Denver and Sidney; it is planning similar schemes in other cities in the coming months.

The burning question is to what extent on-demand mobility can positively **complement**, or even, in some cases, **replace**, public transit. A number of different attempts over the past year have produced mixed outcomes so far. In Innisfil, Canada, where traditional buses made little economic sense due to the small population and large area to be covered, public transit was replaced along fixed routes by ride-sharing services operated by Uber. This initially allowed for similar or even better service levels at a drastically lower cost. However, the convenience of this service led to a surprise jump in costs for the city, and, ultimately, impacted the level of services for users. Demand rose unexpectedly and, given that per capita costs were essentially fixed, the city had to increase its public transport

budget. In a bid to keep costs under control, it decided to cap the number of trips per user. This was rather perverse logic, as an increase in patronage of traditional public transit would normally shrink the per capita public subsidy.

Other initiatives, however, have demonstrated how e-hailing can be used to complement traditional public transit to improve service and efficiency at system level. In Seattle, for instance – along with King County and Sound Transit – the "Rideshare to Transit" pilot program offers a solution that helps prevent people from using ride-hailing for the entire trip. The program offers a discount on Lyft and Uber services to incentivize commuters to use ride-hail services to transit stops only, which thereby helps solve the first- and last-mile travel challenge. In Detroit, the "Night Shift Program" offers Lyft services to citizens working late-night shifts, when public transit is not available. Similarly, Brussels taxi companies have such a program, named Collecto, in partnership with the local public transport operator. In Berlin, in partnership with Berlin's Berliner Verkehrsbetriebe (BVG), ViaVan powers and operates the world's largest public on-demand fleet (185 vehicles) with more than 50% electric vehicles.

However, on-demand public transit is not only a private sector matter: transit operators often deem it appropriate to develop their own DRPT solutions in order to deliver mobility policy while addressing new mobility behaviors and reducing the cost of operation. Today, many public transit operators are experimenting with demand-responsive transportation pilots to complement public transit, and some have led to successful rollouts within defined areas. These include two UK initiatives: "Slide" by RATP Dev in Bristol and "ArrivaClick" by Arriva in Liverpool, Leicester and Sittingbourne.

On-demand solutions may well prove to be harmonious complementary services to public transit and, in some cases, replace fixed-route/fixed-schedule services, provided there is a business case based on accurate demand planning and sound cost-benefit analysis. However, the extent to which these solutions will be operated by private and public players in future is still to be defined. The answer will depend on the ability of public transit operators to develop the required levels of agility to run services which are, by definition, less predictable than their historical offerings. It will also depend on whether private players can achieve the appropriate level of flexibility as they work with a number of different stakeholders, developing services to address the public interest at large. That said, we have no hesitation in recommending that operators experiment further as they assess the opportunities in on-demand public transit.

4. Critical role to play by authorities

4.1   City authorities have a critical role to play

Looking at the challenges outlined above and the potential for on-demand mobility solutions to significantly influence mobility systems, it is clear that – if well framed – they could improve public transit systems for millions of people. But regulation is critically important. While over-regulation can stifle natural market development, lack of – or weak – regulation can lead to a "mobility jungle", which is not in the interest of some of the key stakeholders. Authorities need to find the right balance between "framing" ride-hailing platforms – via rules relating to issues such as market entry, operating and safety conditions, and data-sharing – and "enabling" value creation by providing the right infrastructure and incentives to foster innovation and collaboration. This will support the development of the e-hailing market to the benefit of the public at large.

As described below, regulation of e-hailing – as is the case with most new mobility solutions – encompasses numerous dimensions. It typically requires a "test and learn" approach to devise the most appropriate regulatory scheme, one that is tailored to city specifics. Among the key concerns authorities face are:

■ **Unleveled competition:** TNCs have historically operated in a regulatory grey area, which made their pricing extremely competitive, thereby creating an unlevel playing field versus most conventional taxi companies that had to acquire and amortize expensive licenses – the so-called "medallions".

■ **Weaker adherence of PHV ride-hailing platforms to operation and safety regulations:** Regulators have historically had limited access to ride-hailing platforms' business models and associated risks, which could undermine the application of best practices when it comes to safety standards. In some instances, drivers have been found working without valid driver's licenses, or using unlicensed vehicles.

■ **Detrimental impact on congestion:** Ride-hailing was initially perceived as a phenomenon that would reduce traffic congestion. However, if not properly regulated, it can lead to traffic increases in cities, and thus increase congestion (See the blue box on this topic).

■ **Labor issues:** In the absence of specific regulations, TNCs have historically contracted their drivers as agents rather than employees. As a result, many have suffered unsatisfactory working conditions, uncertainties in terms of revenues, and sometimes inadequate insurance coverage.

Call for public transport authorities to "frame" and "enable" *e-hailing mobility solutions*

Numerous surveys (most of which were performed in the US) reveal that only about 20 percent of e-hailing trips actually replace personal car trips. Another 20 percent replace traditional taxi services, while the bulk (60 percent) takes the place of public transit, biking and walking, or would not have been made at all without the availability of ride-hailing platforms.

Research performed in 2018 by Schaller Consulting et al. in nine major US cities found that over the past six years, e-hailing has added 5.7 billion vehicle miles and increased trips by 241 percent. The study added that the majority of e-hailing users would have taken public transit, walked, biked or foregone their trips if their ride-hailing apps had not been available. It could be argued therefore that e-hailing providers are siphoning off public transport passengers who can afford their services. Other studies advocate the benefits of e-hailing solutions, citing more efficient use of capacity compared with traditional taxi companies. This is based on e-hailing drivers being more likely to have passengers on board than traditional taxi drivers, who spend much of their time cruising for hails, or drivers of private cars, who must dedicate a certain amount of time looking for parking spots.

While the ridership of ride-hailing platforms is increasing, it should not be demonized alone for overall congestion increases. Today, people prefer to ride in their own cars for over 73 percent of their trips, and 75 percent of personal car trips are made alone.

Indeed, if the e-hailing market is properly regulated, e-hailing services will constitute a convenient addition to mobility systems:

■ They can complement sustainable transport modes by allowing efficient first- and last-mile services.

- They can be an alternative to public transport during night hours, when transit options are scant, and offer a valuable service in areas with poor transit coverage and low car-ownership rates.

- They can contribute to reducing the number of cars on the street through ride-sharing and, probably more importantly, complementing other public and shared modes to foster adoption of the mobility-as-a-service concept.

However, these benefits will only materialize if city authorities consider local specifics and find the right balance between "framing" and "enabling" coherent development of on-demand mobility.
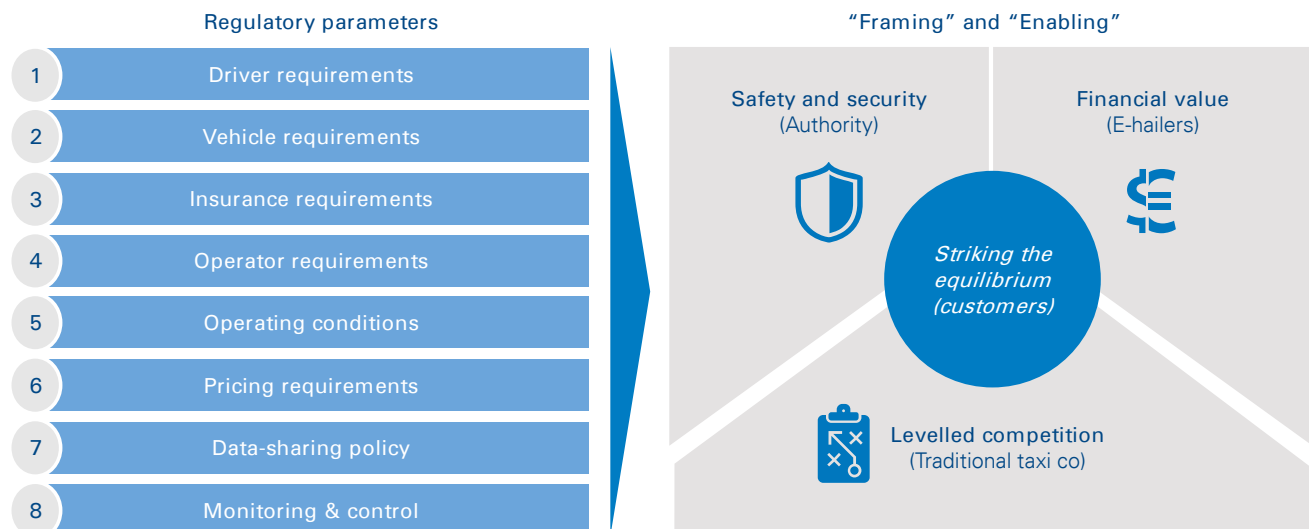
4.2 Appropriate "play book" to regulate ride-hailing platforms and secure a "level playing field"

As mentioned above, it is critical that a certain level of regulation be put in place to secure the virtuous development of on-demand mobility solutions within cities and regions. It also provides the necessary guidance to support the industry's development until the new mobility-on-demand segment reaches its full maturity, and stabilized industry standards are sufficient to make market players exercise the necessary self-control. Such regulation should maximize benefits for the end customer, while striking the right equilibrium between the interests of the different stakeholders: ensuring safety and security in the city, enhancing financial value, and entertaining a "level playing field" for all – both traditional and new actors.

There is not a "one size fits all" solution with regards to regulation of on-demand mobility in cities. Given that local specifics are essential, we provide below an overview of the key parameters that policy makers must consider when devising appropriate regulatory frameworks for on-demand mobility solutions:

- **Driver requirements (capabilities and backgrounds):** Expectations of drivers typically include a minimum age, a certain amount of driving experience and history, absence of criminal convictions or offences, medical fitness, a level of city knowledge, proficiency in the local language, and some sort of proof to show customers that the person is a legal driver. They may also be obliged to fulfill certain duties apart from driving, for no additional pay – for instance, carrying a passenger's guide dog or helping disabled passengers with wheelchairs. Some regulators also mandate driver testing, training and working time. It is widespread practice to impose similar requirements regarding health and criminal status on drivers of traditional taxis and private-hire vehicles. However, some cities' qualitative requirements are more stringent for traditional taxi drivers. In London, for instance, language and topological tests are more demanding for traditional black-cab drivers than for drivers of private-hire vehicles. Regulations may also allow one driver to work (or not) for several e-hail companies, or restrict them to one or selected companies.

- **Vehicle requirements:** Vehicle licensing requirements for private-hire vehicles used by ride-hailing platforms also vary from jurisdiction to jurisdiction. Some allow use of private vehicles, while others mandate dedicated fleets of licensed vehicles. Other vehicle requirements typically include vehicle categories (e.g., engine type) and maximum age,

Figure 7: Key regulatory parameters for authorities to consider when devising on-demand mobility regulatory frameworks

equipment (safety gear, CCTV system, payment methods) and exterior (color and appearance), a taxi sign, and the ability to place advertisements. In most cities, vehicle requirements for taxis have historically been very restrictive, including mandates for car model, maximum age of car, width and minimum legroom of passenger seat, minimum wheelbase and track width, etc. As most of these are currently not applicable to private-hire vehicles, they impede a level playing field. Meanwhile, most cities currently prohibit e-hailers from carrying any forms of advertisement (contrary to conventional taxis), which denies them a significant source of revenue.

- **Insurance requirements (applicable to drivers and vehicles):** Insurance requirements can vary from standard car insurance to compulsory third-party and property insurance. Regulators can also impose guidelines on insurance coverage for the benefit of the customer. In most cities, insurance requirements have historically been very restrictive for traditional taxis (an insurance certificate showing full responsibility coverage), while requirements for private-hire vehicles are currently less prescriptive in most cities due to absence of specific regulations for e-hailers.

- **Operator requirements:** Operator requirements gained importance with the rise of the private-hire segment and the e-hailing business. This was because most regulations had been introduced to protect traditional taxi companies from unleveled competition, as the private-hire and e-hail segments were subject to less stringent regulations in terms of drivers and vehicles. One important requirement relates to the e-hail entity set up: an e-hail company can be set up in a wide variety of forms:

  – A non-regulated business.

  – A business subject to additional requirements, e.g., London requires the private-hire segment and e-hailers to have at least one physical operating center in the city and a fixed-land line telephone number for bookings which is manned 24/7.

  – A licensed entity: Required to either obtain a business license (similar with traditional taxis) or, in some cases, submit a tender for selection as an e-hail operator by the authority.

- Another requirement concerns the permissible size of the e-hailer fleet. Restrictions on fleet sizes can vary from no limit to a cap on the number of active vehicles at city level, or on the number of vehicle-operating permits per company. There can even be specific requirements relating to the minimum level of utilization in certain areas, as is currently the case in certain parts of New York City. Another contentious area is remuneration: a minimum wage or

level of pay per trip for drivers. Policies here can vary from no regulation to strict requirements. New York's Taxi & Limousine Commission, for example, has established a formula to calculate the minimum pay per trip that high-volume operators must give their drivers. It is based on the driver's time spent on the road, the distance traveled, and the degree of utilization, which takes into account whether the vehicle is wheelchair accessible.

- **Operating conditions:** The key issue here relates to the extent to which e-hailers are entitled to benefit from the preferred conditions for conventional taxis, such as use of dedicated taxi and bus lanes, exemption (when applicable) from congestion charges, and free use of on-street waiting areas. In Washington DC, for instance, parts of the curb at five highly trafficked areas have been dedicated to e-hailing companies since 2018. Another hot topic is the question of whether e-hailers should be permitted to pick up passengers flagging on street. This requires e-hailers to be easily identifiable, and a waiting period must expire before an e-hailer can pick up a customer. Applying conventional taxis' preferred operating conditions to e-hailers – putting them on a level playing field with traditional taxi operators – can make perfect sense in situations in which they are subject to stricter requirements for drivers and vehicles. Several cities are investigating such possibilities.

- **Pricing:** Pricing requirements are typically aimed at balancing the level of profitability desired by ride-hailing platforms with reasonable prices for their customers. In some cities, it also helps even out the competition between traditional taxis and e-hailers. E-hailers' prices can be regulated in ways that make them comparable to local taxi fares, or they can only be higher or lower by a given percentage. In several cities, all taxi companies – including e-hailers – are required to pay a ride levy per trip (e.g., €1 in Austrian municipalities). The accumulated proceeds of these levies are then distributed among traditional taxi players to compensate for losses brought about by liberalization of e-hailing. Pricing restrictions can be used to regulate e-hailers' ability to apply dynamic pricing models, under which prices can be raised during periods of high demand – a concept known as "surge pricing". Saudi Arabia, after initially opting for full liberalization of e-hailers – and prohibition of traditional taxis – is now starting to regulate tariffs.

- **Data-sharing policy:** Some regulators allow e-hailers to keep customer data on local-base server infrastructure, while others require all customer data to be (anonymously) shared with local authorities. In some cases, e-hailers must install special equipment in their vehicles that records and transmits dynamic data to authorities. This is likely to become increasingly common, especially for authorities that

are setting up mobility data lakes. In Europe, for example, the ITS EU Directive urges authorities to develop "National Access Points" (NAPs) which is expected to spur the creation of data lakes relating to mobility. Regulators can also restrict data sharing with third parties. Some e-hailers, such as Uber and Lyft, are proactively tackling data-sharing concerns, and the Ford motor company recently announced the launch of a data-sharing public-private partnership scheme with public authorities through SharedStreets. The non-profit data-sharing platform will provide vehicle-speed data, and Ford and authorities will collaborate on development of a model for curb-usage data.

Another requirement relates to installation of equipment (typically CCTV cameras) to monitor safety and potential illegal actions by the driver or customer. More recently, in the case of the Netherlands and New Zealand, equipment has been imposed to monitor drivers' working hours, distance traveled, districts served and speed compliance.

- **Monitoring and control mechanisms:** Given how difficult it is to enter the on-demand mobility segment, there is great temptation to cut corners once the business is in operation. As a result, most cities have put in place strict control and enforcement mechanisms, and the police, or special entities (such as compliance officers in London) are entitled to carry out on-road and at-operator checks, with punishments ranging from fines to license removal. Some authorities go so far as to engage e-hailing customers in monitoring activities. In London, they are encouraged to check whether taxis or private-hire vehicles – and drivers – have the necessary licenses by comparing them against the existing registry, and then report any suspicious activity.

Regulating a market that is changing as rapidly as the on-demand mobility sector is no easy task for city authorities, especially as the taxi business is such a conservative industry. This notion has been proven repeatedly as traditional taxi companies have pushed regulators to put up obstacles to emerging e-hailers, rather than making any efforts to change themselves.

However, banning ride-hailing platforms or artificially restraining them by imposing draconian regulations makes the passenger lose out. When regulation is too stringent, it stifles innovation, reduces convenience and erodes service quality. Giving ride-hailing platforms an open road is also not optimal, as in the absence of a certain level of control, it might lead to an imbalance in the playing field between the different players. In a worse scenario, it could lead to unsatisfactory operational and safety conditions at the expense of both drivers and users.

The trend towards on-demand mobility is already here, and has injected a great deal of uncertainty into a taxi industry that has been stable for many years. Some cities originally considered it the right move to impose stringent requirements on e-hailing. However, most authorities now recognize that devising smarter regulation, by approaching the topic with great care and open minds can bring immeasurable benefits to all stakeholders.

Experience teaches us that a "test and learn" approach is the optimum way forward. By setting requirements and testing them in the field in close collaboration with selected operators, as has been done successfully in Lisbon and Singapore, a form of on-demand mobility can be introduced that is in the interests of all.

Arthur D Little

Figure 8: Market equilibrium could be achieved by striking the right balance between "framing" and "enabling"

Parameters	Requirements (Lighter regulation → Stricter regulation)				
Driver requirements	Driving history background check (short-term, lasts 3 years)	Driving and criminal history background check (short-term, lasts 3 years)	Driving history and criminal history background check (long-term, lasts 7 years)	Full check and regular driver's training & testing	Additional specific requirements
	Driver can work for any ride-hailing platform	Driver can work for limited number of TNCs only (specific city requirements)		Driver can work for one e-hailer only	
Vehicle requirements	Private vehicles	Dedicated fleet of licensed vehicles with no differentiation vs. taxi market	Dedicated fleet of licensed vehicles with differentiation vs. taxi market		
	Vehicle categories and maximum ages	Equipment requirements	Exterior design and appearance	Ability to place advertisement	
Insurance requirements	Insurance requirements compared to standard car insurance	Basic insurance coverage when operators accept riders	Higher insurance coverage when operators are carrying or picking up customers	Compulsory full responsibility covering insurance certificate	
Operator requirements (for e-hailing companies)	Ride-hailing platforms as "non-regulated" companies (no specific requirements)	Ride-hailing platforms as "non-regulated" companies with specific requirements (e.g., local offices, call center)	Ride-hailing platforms set up under special license	Ride-hailing platforms to bid for competitive license organized by city authorities	
	Number of e-hailers and fleet size not regulated	Limitation of the number of vehicles permits (e.g., number of vehicles at city level)	Limitation of the number of e-hailers at city level (e.g., max number of e-hailers at city level)	Limitation of number of active vehicles per e-hailer (max number of vehicles during a single hour)	Specific requirements in terms of utilization in certain areas (e.g., min. % utilization)
	Absence of regulation related to minimum wage or minimum pay per trip	Regulation related to minimum wage or minimum pay per trip	Regulation related to minimum driver wage or minimum pay per trip		
	Absence of regulation of driver pay (no minimum wage or pay-per-trip)	Regulation related to minimum driver wage or pay per trip, with the ability to apply for company-specific rates	Regulation related to minimum driver wage or minimum pay per trip (with no exceptions)		
Operating conditions	Entitled to the same preferential conditions as traditional taxi operators: use of dedicated on-street waiting areas & dedicated taxi/bus lines	Entitled to some of the same preferential operating conditions as traditional taxi operators	No preferred operating conditions (same rules as apply to private cars)		
	E-hail vehicles can pick up passengers flagging on-street	E-hail vehicles can only accept customers via the e-hail application	E-hail vehicles can only accept customers via the e-hail application after respecting a waiting period		
Pricing	Prices non-regulated	Prices regulated to be comparable to taxi	Prices regulated to be higher than taxi by a defined %	Prices regulated to be higher or lower than taxi only by a defined %	
	Prices non-regulated	Prices regulated to be comparable to taxi			
	No restriction on surge pricing	Surge pricing is allowed but under specific conditions (e.g., period of the day, cap)	Surge pricing is not allowed		
Data policy	No requirements on data usage and sharing	Restrictions on the usage of customer data (e.g., no sale of data to third parties)	Restrictions on the usage of customer data & requirement to share data with local transport authorities		
Monitoring & control	No or limited monitoring mechanisms	Monitoring mechanisms in place by authorities	Requirement to install monitoring equipment on-board vehicles		

Source: Arthur D. Little analysis

5. The way forward

Urban mobility is a strategic issue for the world's cities that is being addressed by many. However, widespread failure to successfully navigate the complexity of the issue indicates that most cities are simply not equipped to tackle it. Coming up with a mobility paradigm that exploits all the opportunities that modern technology has to offer is one of the greatest challenges that our major cities face. It requires change, but also represents an amazing opportunity because half the potential on offer has yet to be harvested.

The on-demand mobility market, just like digital platforms, is here to stay. Existing mobility providers will continue to come under pressure from e-hailers, as well as numerous other forms of new mobility, and while the technology and operating-model gaps persist, they are likely to remain the underdog.

Despite their skills shortfall, traditional mobility solutions providers must rise to the challenge, reinvent themselves and make their propositions relevant in the digital age. If this situation is not adequately managed, it will only get worse because the introduction of self-driving technologies in the not-too-distant future will further blur the boundaries between scheduled public mobility utilities and private, on-demand mobility solutions.

As they are at a competitive disadvantage, conventional taxi companies must reinvent themselves to drive further differentiation between themselves and the new players. These companies have two options: programs of internal transformation to keep full control of the mobility value chain, or partnerships with taxi e-hailing platforms.

Regulators, meanwhile, are urged to create frameworks that will unleash the potential of these emerging mobility services, while simultaneously ensuring development of mobility systems that work for the benefit of all, increasing consumer choice and improving overall quality of services. While there is no one-size-fits-all solution, authorities must get their regulatory frameworks in order – considering local specifics – to manage the transition and achieve a level playing field in the on-demand mobility sector. In this context, applying a "test and learn" approach – devising requirements and testing them in the field with selected operators – is a vital part of the answer.

Arthur D. Little's Future of Mobility Lab

As the world's first management consulting firm, Arthur D. Little has been at the forefront of innovation for more than 125 years. Arthur D. Little is acknowledged as a thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries.

The Future of Mobility (FoM) Lab, launched in 2010, is Arthur D. Little's contribution to tackling the urban mobility challenge. With this lab, Arthur D. Little aims to support cities, as well as public and private actors, in shaping the extended mobility ecosystems of tomorrow and facilitating an open dialog between urban mobility stakeholders.

Arthur D. Little's Future of Mobility Lab gathers under the same roof cross-industry and cross-functional professionals to support governments, authorities, mobility solutions providers (public and private) and investors in shaping their roles in future mobility ecosystems, through:

■ Performing foresight analysis and developing medium- to long-term mobility scenarios in uncertain environments.

■ Advising governments and authorities on the definition of mobility, as well as a vision, policies and roadmaps at national, regional and city levels, preferably through a collaborative approach involving key public and private mobility stakeholders.

■ Assessing urban mobility systems (maturity, performance and innovativeness) as input for policy development, tendering tactics development, or go-to-market strategies.

■ Performing due diligence with innovative business models and solutions.

■ Supporting new mobility actors in defining the most appropriate go-to-market strategies.

■ Developing business and operating models for mobility platforms, such as MaaS and urban logistics schemes.

If you have specific enquiries or would like to arrange an informal discussion on new mobility issues and how they affect your business, please contact futuremobility.lab@adlittle.com. You can also access the latest publications of the Future of Mobility Lab at www.adl.com/futuremobilitylab.

Figure 9:   Arthur D. Little's Future of Mobility Lab – since 2010

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The Future of Mobility Lab is **Arthur D. Little's contribution to tackling the urban mobility challenge.** Arthur D. Little aims to use its Future Lab to support actors **shaping extended mobility ecosystems of tomorrow** and act as a catalyst to enable and facilitate an open dialogue between mobility stakeholders.

– Ignacio Garcia Alves, Arthur D. Little Global CEO

1	Foresight analysis and mobility scenario development in uncertain environment
2	Definition of national/regional/urban mobility vision, strategies and roadmaps
3	Opportunity assessment & due diligence of innovative business models and solutions
4	Go-to-market strategies (incl. set-up of multi-stakeholders ecosystems)
5	Assessment of mobility performance (Urban Mobility Index)

www.adl.com/futuremobilitylab

Source: Arthur D. Little analysis

Contacts

If you would like more information or to arrange an informal discussion on the issues raised here and how they affect your business, please contact:

Austria
Karim Taga
taga.karim@adlittle.com

Belgium
Francois-Joseph VanAudenhove
vanaudenhove.f@adlittle.com

China
Yusuke Harada
harada.yusuke@adlittle.com

Czech Republic
Dean Brabec
brabec.dean@adlittle.com

France
Vincent Bamberger
bamberger.vincent@adlittle.com

Germany
Ralf Baron
baron.ralf@adlittle.com

India
Srini Srinivasan
srinivasan.srini@adlittle.com

Italy
Francesco Marsella
marsella.francesco@adlittle.com

Japan
Yuma Ito
ito.yuma@adlittle.com

Korea
Kevin Lee
lee.kevin@adlittle.com

Latin America
Rodolfo Guzman
guzman.rodolfo@adlittle.com

Lebanon
Albert Kostanian
kostanian.albert@adlittle.com

Middle East
Thomas Kuruvilla
kuruvilla.thomas@adlittle.com

The Netherlands
Martijn Eikelenboom
eikelenboom.martijn@adlittle.com

Norway
Petter Kilefors
kilefors.petter@adlittle.com

Poland
Piotr Baranowski
baranowski.piotr@adlittle.com

Russian Federation
Alexander Ovanesov
ovanesov.alexander@adlittle.com

Singapore
Yuma Ito
ito.yuma@adlittle.com

Spain
Jose Manuel Fernandez Bosch
fernandezbosch.josemanuel@adlittle.com

Sweden
Petter Kilefors
kilefors.petter@adlittle.com

Switzerland
Ralf Baron
baron.ralf@adlittle.com

Turkey
Coskun Baban
baban.coskun@adlittle.com

UK
Tom Teixeira
teixeira.tom@adlittle.com

USA
Sean McDevitt
mcdevitt.sean@adlittle.com

Rethinking on-demand mobility

Turning roadblocks into opportunities

Arthur D. Little

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations.

Our consultants have strong practical industry experience combined with excellent knowledge of key trends and dynamics. ADL is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations.

For further information please visit **www.adlittle.com** or **www.adl.com**.

www.adl.com/RethinkingOnDemandMobility