

How business can help solve the urban mobility challenge

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The proportion of people living in urban areas around the world is constantly rising, and with it the challenge of mastering the growing complexity of urban travel. In this article the authors present the results of their assessment of urban mobility in 66 cities worldwide, using their own detailed urban mobility index. They then explore the factors explaining the differences between various urban areas and finally, discuss three business models that providers of urban mobility can follow.

One thing is certain: the future will be urban. Of the world's total population of 6.8 billion people in 2010, 51 % were living in urban areas; this urban share will rise to 61 % of 8.2 billion people in 2030, and to 70 % of 9.2 billion people in 2050. Likewise, urban areas will account for 86 % of world GDP in 2025, up from 80 % in 2007, representing an enormous economic potential. It is no surprise then that urban mobility, measured as the number of person-kilometres travelled per annum, is expected to almost triple between 2010 and 2050, when it will account for 64 % of total mobility.

What is less certain is how enjoyable or miserable that future will be for urbanites. If current trends continue, urban mobility systems are going to break down spectacularly, with severe consequences. The so-called triple bottom line – people, planet, profit – could suffer a serious blow. For example, a US citizen by 2050 will on average suffer some 100 hours of congestion-related delays a year, which is triple the number in 1990. Seventeen % of the planet's bio-capacities will be needed to make urban mobility possible in 2050, five times more than in 1990. And annual investment in urban mobility will have to quadruple to some € 800 billion worldwide by 2050.

Of course, future forecasts can be as treacherous as historical statistics. As physics Nobel laureate Niels Bohr famously said: "Prediction is very difficult, especially if it's about the future." But at least predictions call on human ingenuity to break, bend or exploit trends for the greater benefit of mankind. It is clear that urban mobility is a major issue affecting citizens, businesses and governments all over the world. Without intervention we will indeed grind to a standstill. Yet urban immobility is not doomed. As cities such as Hong Kong and Amsterdam show, the transformative power of innovation can bring effective solutions to the challenge of mobility.



In this article we will first present the results of our assessment of urban mobility in 66 cities around the globe, using our proprietary “urban mobility index”. We will then explore the factors that explain differences in mobility performance, as well as the requirements and strategies to improve performance. Finally, we will discuss three business models that urban mobility providers – including public transport companies, vehicle manufacturers, financial firms, telecommunications operators and various other technology suppliers – can adopt for establishing long-term sustainable solutions for the benefit of all stakeholders.

Measuring urban mobility performance

During 2011 we conducted a study to assess mobility at 66 cities around the globe and to identify the factors that explain differences in performance. To that purpose we developed an “urban mobility index”. The index is an aggregate indicator of the effectiveness and efficiency with which a city fulfils mobility-related goals (such as travel time, carbon emissions and number of fatal accidents) and of the extent to which it has implemented innovative mobility concepts (as measured, for example, by the prevalence of cycling, car sharing and the penetration of smartcards). When comparing cities, we considered their size, prosperity and the prevalence of public versus individual motorized transport (see box for more details on the research method).

The analysis reveals a number of remarkable results. First, there is a clear correlation between the use of innovative mobility concepts on the one hand and mobility effectiveness and efficiency on the other. Cities that promote walking, cycling, bike sharing, car sharing and smart mobility cards as part of an integrated mobility vision and strategy do reduce travel times, fatal accidents and carbon emissions. All but two of the top ten performing cities have a strong focus on public transport, walking and cycling, with individual motorized mobility commanding less than half of the modal split.

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Urban mobility research method

We first selected and characterized the cities to be included in our study on urban mobility. We covered 66 cities worldwide: the 50 largest cities by population, complemented by 16 cities of major economic significance in Europe, the Middle East and Asia. We categorized each of these into one of six clusters based on modal split (public versus individual, with “individual” meaning that individual motorized mobility – as opposed to the combination of public transport, walking and cycling – accounts for more than half of total mobility), size (large versus small, with 5 million people as the dividing line) and prosperity level (mature vs. emerging, with US\$ 25k GDP/capita as the dividing line). The six clusters are:

- **Public, small, mature:** 12 cities, including Boston, Berlin and Singapore
- **Public, large, mature:** 10 cities, including New York, Paris and Tokyo
- **Public, large, emerging:** 24 cities, including São Paulo, Bangalore and Shenzhen
- **Individual, small, mature:** 11 cities, including Houston, Milan and Dubai
- **Individual, large, mature:** 6 cities, including Los Angeles, Toronto and Madrid
- **Individual, large, emerging:** 3 cities including Ankara, Tehran, Kuala Lumpur

We then constructed an “urban mobility index,” which aggregates the position of a city on eleven indicators. The first six indicators measure mobility performance, i.e. the degree to which mobility-related goals are fulfilled in an effective and efficient manner: average travel speed in the city with all modes of transport, mean travel time to work, number of fatalities per inhabitant, transport-related CO₂ emission per capita, number of vehicles registered per citizen and inhabitant satisfaction with mobility in the city. The other five indicators

The average city achieves only less than half of the potential that could be reached today if it were to apply best practice across all areas. This analysis indicates the significant performance improvement potential cities have and highlights the urgency for cities to address the urban mobility challenge proactively.

measure mobility maturity: vision and strategy for future mobility, number of shared cars per capita, number of shared bikes per capita, penetration rate of smartcards and share of public transport, walking and cycling in the modal split. For each indicator we defined a point scale, with the maximum and minimum end of the scale being defined respectively by the best and worst performance of the 66 cities. The point scales add up to a maximum of 100 points on all indicators combined (i.e. if a city achieves the maximum score on each of the eleven indicators, it will have an index score of 100).

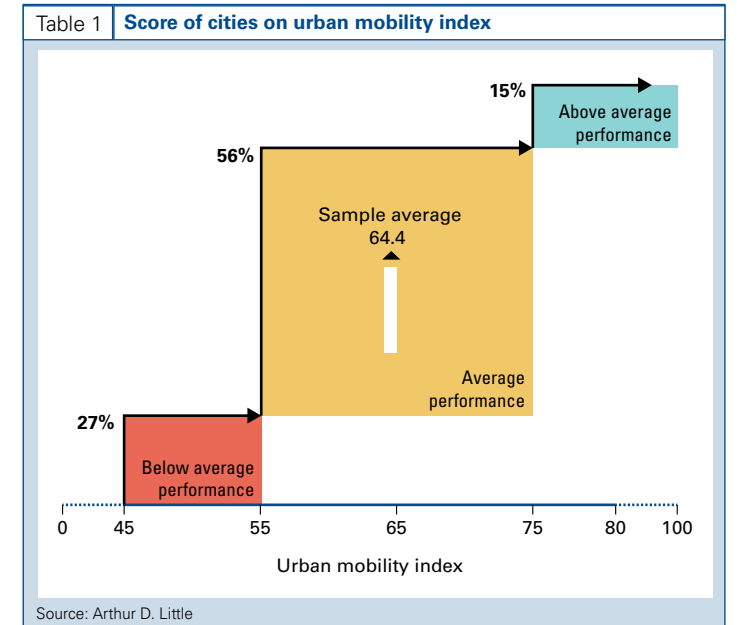
We then carried out desk and field research to score each of the 66 cities on the urban mobility index. We used the scoring results to identify common characteristics and factors explaining differences in performance for each of the six clusters.

Finally, we identified and assessed 39 technologies (e.g. solar-powered bus) and 36 business models (e.g. car sharing) of varying maturity that are or could be used to address the mobility challenges and develop sustainable mobility concepts. These technologies and business models relate to transport, infrastructure, traffic management, and travel planning and payment.

Second, the average score achieved by the 66 cities in the sample is 65 points (64.4). Only 15 % of the cities score above 75 (see Table 1). In other words the average city achieves only two thirds of the potential that could be reached today if it were to apply best practice across all operations. This analysis indicates the significant performance improvement potential cities have and highlights the urgency for cities to address the urban mobility challenge proactively.

Third, even for cities that score highest, namely Hong Kong (81.9) and Amsterdam (81.2), the scope for improving toward the maximum score of 100 is still significant. Hong Kong, for example, scores very high in terms of smartcard penetration – allowing people to use one and the same contactless payment card across transport modes – but lags in terms of car and bike sharing. In other words, a

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near-perfect mobility system does not yet exist in the world today. Full satisfaction with urban transport is not observed in any of the cities studied.

Fourth, city size does not have a significant influence on the mobility score. For example, the small cities of Rome and Athens have much lower scores (57.9 and 53.3, respectively) than the large cities of London and Madrid (78.5 and 71.8, respectively). However, the two other city characteristics that we studied, namely city prosperity and the prevalence of public transport (“modal split”), do have a significant influence on the mobility score. The richer the city and the lower the share of individual transport, the higher the score.

Five, cities in mature regions are not necessarily models that cities in emerging regions should aspire to emulate. Many of the former, such as Tokyo, Prague, Moscow, Atlanta and Miami, still do not appear to have a vision and documented strategies that clearly articulate what they want their future mobility systems to look like. Furthermore, if cities in emerging regions replicate the pathway that cities in mature regions have followed, they risk introducing the very same problems of poor modal split, high carbon

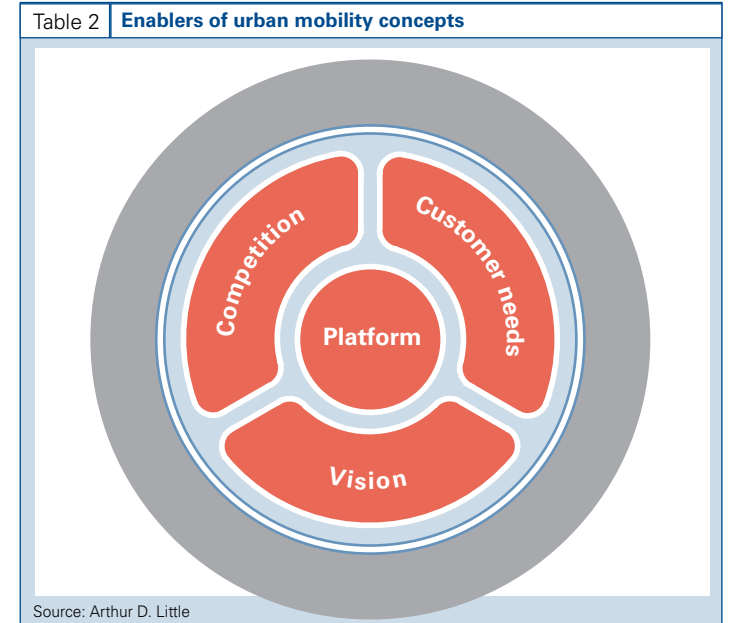
emissions and low travel speed. US cities in particular tend to score low, as their modal split is heavily biased toward cars and their carbon emissions are a multiple of those in Europe.

Improving urban mobility performance

Our study reveals that the root cause of the performance gap is the aversion to innovation within the urban mobility system. By “system” we mean groups of stakeholders, the relationships between these, the rules and incentives that govern their behavior, and the assets and capabilities through which they seek to achieve their objectives.

While poor, let alone deteriorating, urban mobility is a source of daily frustration to citizens, businesses and governments alike, many people are resigned to it as an inescapable consequence of economic development and wealth creation. But urban mobility need not be an intractable problem. Solutions to address the pressing mobility challenges are widely available. This appears clearly in the progress the top-performing cities such as Hong Kong, Amsterdam and London are making. It also appears from our comprehensive review of 39 technologies and 36 urban mobility business models. Some of these technologies are fairly mature (such as electronic tolling, advanced parking systems, the automatic monorail and the Segway), while others are still in the embryonic phase (such as access to the CAN communication network in a car, the automated car, the solar roadway and the straddling train). Likewise some business models are mature (e.g. bike rental), while others are embryonic (e.g. cargo pipelines).

If the availability of good-practice examples, technology and business models is not the bottleneck, what then is holding back resolution of the mobility challenge? Our study reveals that the root cause of the performance gap is the aversion to innovation within the urban mobility system. By “system” we mean groups of stakeholders, the relationships between these, the rules and incentives that govern their behavior, and the assets and capabilities through which they seek to achieve their objectives. Current mobility systems adapt poorly to changing demands, are weak in combining single steps of the travel chain into an integrated offering, find it difficult to learn from other systems, and shun an open, competitive environment. Collaboration on solutions is rare. Rewards for investors are rather meager.



This is a fairly damning verdict, but it also shows the road to redemption. Mobility stakeholders should cooperate on four axes to enable the emergence of innovative and effective mobility concepts (see Table 2):

1. **Establish a collaborative platform.** A platform is an agreement between diverse stakeholders – including infrastructure and service providers, technology suppliers, financiers, regulator, city government and users – leading to a structure that enables them to align their shared objectives and prioritize common initiatives.
2. **Establish and execute a vision.** The senior leaders of the stakeholder groups participating in the platform should formulate and support a common vision for the mobility concept. They should assign accountability to each player. They should institute the willingness and capabilities to improve the concept continuously.
3. **Discover and respond to customer needs.** The mobility concept should be able to adapt to changing demand volumes. It should allow flexible and peak-oriented pricing. And it should offer seamless multimodal services to users.

4. **Initiate competition.** Government should guard over the working of market mechanisms that ensure fair competition between different transport modes, business models and types of infrastructure. It should enable entry by new players. Where applicable, it should establish balanced public-private partnerships within a reliable framework conducive to the provision of competitive services.

Strategic imperatives for city management

As there are no universal solutions, each city will have to assess rigorously all building blocks – infrastructure, transport modes, traffic management and transport information, planning and payment systems – for a tailored, comprehensive overhaul of its urban mobility system.

What this means in practice for senior city executives depends on the type of city they lead. For mature cities with a modal split already oriented toward public transport, “network the system” should be the strategic imperative. They should aim to fully integrate the travel value chain in order to increase citizen convenience and acceptance. They should launch programs such as car taxation and tolling, in combination with the aggressive extension of public transport systems, to further restrain individual motorized transport. In these cities, advanced traffic management systems play a vital role in steering and guiding traffic flow. This strategy is relevant mainly to the top-performing cities, primarily in Northwest Europe, with some in North America and Asia Pacific.

For mature cities with a modal split still characterized by a high share of individual motorized transport, “rethink the system” should be the strategic imperative. They should shape the political agenda towards the idea of a fundamental redesign of their mobility system in which sustainable public mobility takes center stage. As there are no universal solutions, each city will have to assess rigorously all building blocks – infrastructure, transport modes, traffic management and transport information, planning and payment systems – for a tailored, comprehensive overhaul of its urban mobility system. This strategy is relevant for the majority of cities in North America and Southwest Europe.

For cities in emerging countries, “establish a sustainable core” should be the strategic imperative. They should focus on establishing a sustainable system that is capable of satisfying short-term demand at a reasonable cost, without falling into the trap of setting up a mainly individual

motorized system that has to be redesigned later. Given the plethora of diverse available technologies and business models, these cities have a unique opportunity to become the innovative breeding ground for tomorrow’s urban mobility systems. They could leapfrog the legacy systems of large Western cities and build cities with true networked mobility, i.e. the seamless integration of all transport modes, with a single “key” offering convenience to all citizens.

For a glimpse of what networked mobility could mean, consider the case of Zurich, which ranks number twelve in our urban mobility index (score: 74.6). While public transport and walking & cycling in Zurich already accounts for a 65 % share of the modal split – the highest of any city in Western Europe – it has set its sights on further increasing the share of what it calls ecomobility, i.e. the combination of public transport, biking and walking. The idea is simple: rail and car sharing are for long distances, public transport and taxi are for in-city travel, and bicycle and walking are for short distances. The public transport provider and companies from diverse industries cooperate to develop new offerings, such as car sharing, mobility cards and shops. For example, IG Velo is involved in the Bike-to-Work campaign. The Swiss Federal Railways offer a rent-a-bike service. UGZ, the city’s environment and health agency, is having a multi-mobility-day and supporting a “muscles instead of engines” campaign. Another city agency is offering a multi-mobile-city map and a multimodal trip planner. The success of these and other initiatives hinges on four factors. First, integrated traffic information enables travellers to choose flexibly between different means of transportation. Second, there are no barriers between different modes of transport. Third, a plethora of tools supports multimodality: smartphone apps, dynamic pricing, advertisements, discounts, loyalty programs and shared spaces. Last but not least, multimodal mobility has full political support, through parking lot management, the creation of environmental areas, the raising of fuel prices and car taxes and the implementation of fare-collecting systems.

While public transport in Zurich already accounts for a 37 % share of the modal split – the highest share of any city in Western Europe – it has set its sights on further increasing the share of what it calls ecomobility, i.e. the combination of public transport, biking and walking.

Business models for suppliers of mobility solutions

Having city leaders articulate a vision and strategy for their mobility system is one thing, getting companies to contribute and commit to the development and subsequent realization of the vision is another. Commercial enterprises will do so only if they can earn a return commensurate with the risks taken. As we have noted before, solving the urban mobility challenge requires system-level innovations. These are notorious for “chicken or egg” situations. Before a company invests in, say, charging stations for electrical vehicles, it needs reassurance that there will be a sufficient number of users buying electrical vehicles. But users will buy only when they are reassured there will be a sufficiently dense network of charging stations. So the question is: Which business models can companies adopt when seeking to participate profitably in urban mobility solutions?

Through our research we have identified three distinct business models. The differences between the three relate to customers targeted, products and services offered, assets and capabilities put to use, and revenue sources (see

Table 3 | Key features of three business models

	Target customers	Offerings	Core assets and capabilities	Revenue sources
Model 1: The mobility services platform manager	Traveller community at large	Single point of access for getting information, planning, booking and paying for a journey	<ul style="list-style-type: none"> IT-enabled platform Consumer interface Supplier sourcing and contracting 	<ul style="list-style-type: none"> Transaction fees Advertising Interest income
Model 2: The premium mobility chain integrator	Individual high-end traveller	Personalized seamless journey to get as quickly as possible from A to B	<ul style="list-style-type: none"> Brand Dense service network Partnerships 	Fee for service
Model 3: The city mobility solutions provider	Cities	Tailored integrated multimodal mobility solutions on a turnkey basis	<ul style="list-style-type: none"> System integration and contracting Public-private partnerships 	Case-specific

Source: Arthur D. Little

Table 3). The descriptions that we offer below are idealized archetypes, yet they could serve as a source of inspiration for more specific business concepts.

Model 1: The mobility services platform manager

A supplier adopting this business model offers any traveller a platform through which he or she can find travel information, plan a journey, make a booking and/or pay for the journey. The platform serves as a medium through which the supplier tries to reach as many users as possible in the traveller community being targeted. As the supplier acts as an aggregator of underlying services offered by third parties (e.g. parking managers, bike-sharing providers and point-of-interest search application developers), sourcing and contracting are critical capabilities. The supplier receives revenues from, among other sources, fees from partner transactions, fees for space on the platform, advertising, and interest income from the float on e-wallets. We estimate that about one third of the 66 cities we studied lend themselves to this business model, particularly mature cities that already have a large public share of the modal split.

Hong Kong Octopus Ltd is an example of a company that has adopted this business model. It supplies the Octopus smartcard that can be used across public transport modes: bus, subway, high-speed train, tram, ferry and long-distance train. About 25 % of transactions are not transport-related, as the card is also accepted at about 3,000 service providers. It can be used at close to 200 retail outlets (including food, entertainment and leisure), for parking in all Hong Kong streets and at some 600 private parking lots, to gain access to some 200 companies and buildings, and at hospitals, schools, libraries and other public institutions. Ninety-five % of Hong Kong inhabitants own an Octopus card.

Model 2: The premium mobility chain integrator

A supplier adopting this business model offers individual high-end travellers a personalized seamless journey as quickly as possible from A to B, whatever combination of transport modes it requires. Imagine a businessperson or

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celebrity flying into Moscow. The journey to the destination in heavily congested Moscow might take four and a half hours in total. With a premium personalized service, the journey time could be cut to 45 minutes. First, the traveller takes a branded flight in alliance with an airline; upon arrival a chauffeur takes the traveller to a helicopter taxi; there is a transfer by taxi to the city centre; a limousine service takes care of the last mile to the destination. This description is of course a little fanciful, but it brings the point home: there is a customer segment with strong purchasing power that is willing to pay a premium for speed, safety and convenience. This segment in principle exists across all 66 cities worldwide. Clearly it takes a strong brand and a dense service network (or at least trusted partners) to make and deliver on this promise.

This business model is typically the domain of premium car manufacturers such as Daimler. They are in a position, for instance, to provide small pickup cars (e.g. the Smart car), branded parking spaces where the pickup car can be left, and a branded first-class section in a suburban train.

Model 3: The city mobility solutions provider

A supplier adopting this business model targets cities instead of travellers. It offers cities tailored integrated multimodal mobility solutions on a turnkey basis. It acts as a system integrator and contractor for the various components of the solution. These could include parking infrastructure, charging infrastructure for electric vehicles, automated fare collection, a bike-sharing system, city buses, financial services and mobility planning. This is an area where public-private partnerships and so-called BOOT (build-own-operate-transfer) schemes can play a very useful role. Clearly the market for this offering is global.

This business model fits quite naturally with infrastructure companies or with consortia of such companies. Siemens, for example, has established a special Infrastructure & Cities business unit to address this market.

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Insights for the executive

Improving urban mobility is a challenge of epic proportions. As the urban population and economic prosperity grow, cities find it increasingly difficult to deliver fast, safe and environmentally-friendly transport to citizens and businesses. Fortunately, there is a wealth of good-practice examples, technologies and business models on which the various stakeholders can draw to devise effective and sustainable mobility solutions. The stakeholders – including users, city government, infrastructure and service providers, technology suppliers, financiers and regulators – should commit to four actions:

- Establish a collaborative platform to align objectives and prioritize common initiatives for the city's mobility system.
- Establish and execute a vision and strategies that clearly articulate what the future mobility system for the city should look like.
- Discover and respond to user needs and usage patterns with the aim of offering seamless multimodal services.
- Introduce market mechanisms that ensure fair competition between different transport modes, business models and types of infrastructure, and enable entry by new players.

Once these conditions are fulfilled, there is plenty of scope for commercial enterprises to commit to the development and realization of mobility solutions, thereby earning a return commensurate with the risks taken. Which business model any specific company adopts – i.e. how it makes money – depends on the assets and capabilities it can put to use, the customer segments it targets (whether the traveller community at large, individual high-end travellers or cities themselves) and the unique products and services it offers (such as a consumer interface, a personalized service or a turnkey infrastructure solution).

Clearly urban mobility is a major societal challenge. But human ingenuity and innovation, if feeding off a well articulated and politically backed vision, can bring solutions for the benefit of all.

For the full report of the “Future of Urban Mobility” study, please contact the authors.

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