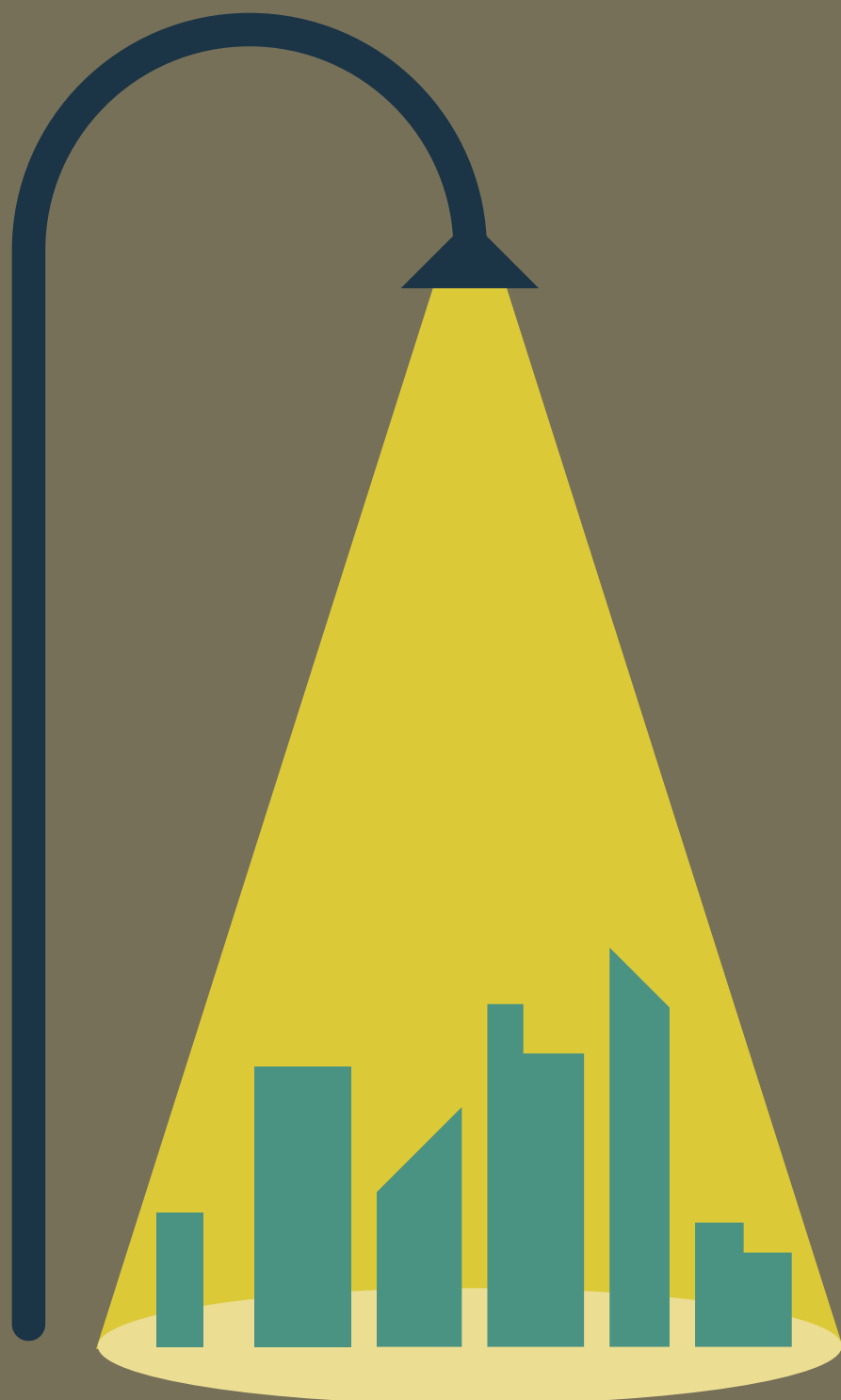


MasterCard

MasterCard Enterprise Partnerships

Connecting cities:
Emerging markets



MasterCard is a technology company in the global payments industry. We operate the world's fastest payments processing network, connecting consumers, financial institutions, merchants, governments and businesses in more than 210 countries and territories. MasterCard's products and solutions make everyday commerce activities – such as shopping, travelling, running a business and managing finances – easier, more secure and more efficient for everyone.

The MasterCard Enterprise Partnerships team has been formed to bring MasterCard's existing assets, technology, network, reach, products and solutions to bear in areas that are outside MasterCard's traditional domain.

We are partnering with global market leaders who have significant depth of experience in their industries, combining their knowledge and infrastructure with our assets in order to drive real enterprise value.

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Foreword

We believe that smarter city transit and travel can unlock a city's potential and bring enormous benefits to business and citizens. We are joining forces with experts at the forefront of change, and some of the world's largest cities, to create partnerships that have the ability to make the connected city of the future a reality now.

We commissioned the Future Foundation to undertake research into the opportunities and challenges facing some of the world's developing markets. This Connecting cities: Emerging markets report has been produced to kick-start a dialogue about how we can take collaboration in urban mobility and development to the next level and ensure that we build smart cities for smart citizens. We wanted to uncover the difficulties faced by average citizens when going about their daily lives interacting with cities, and find out what global thought leaders had to say about future trends in this urban mobility.

At MasterCard Enterprise Partnerships, collaboration is at the heart of what we do and our work is based on combining our strengths and expertise with that of others to deliver solutions that would just not be possible alone. We would like to thank all the experts who gave their time to take part in this research and thank the Future Foundation for creating a fascinating report.

We hope that this report kick-starts a dialogue that helps to form new partnerships focused on unlocking the true potential of cities.

Methodology

In this report, we describe how mobility within cities is changing and how the way in which people travel across cities, interact within a city and go about their everyday lives is driving cities to adapt and become smarter.

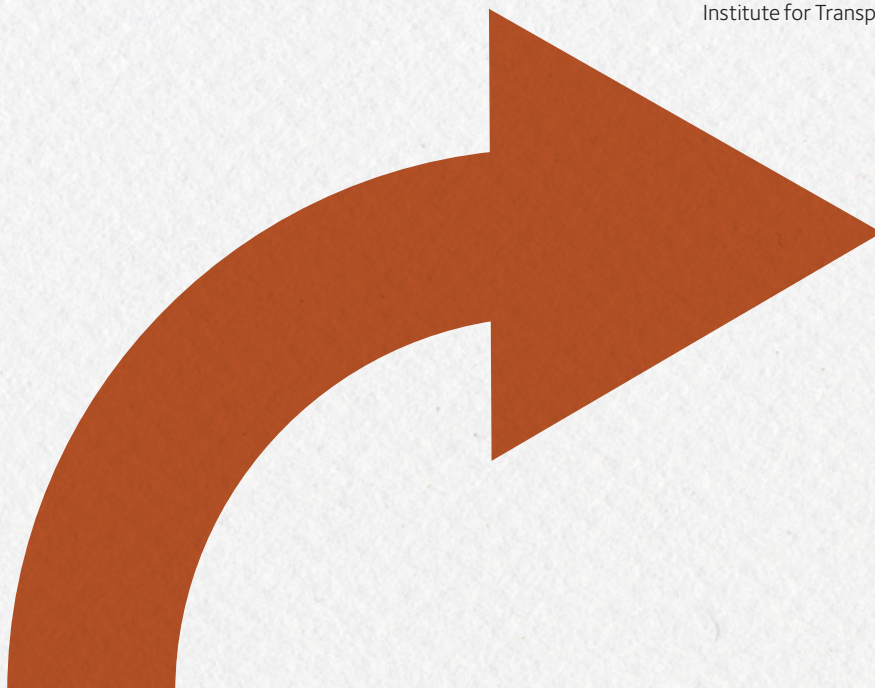
To create this report we carried out new quantitative research and interviewed six leading experts in urban design and transportation. The experts are based in Brazil, Hong Kong, China and the United States, providing local and international insight into the key issues impacting urban mobility across some emerging markets.

The quantitative consumer research was conducted online in Brazil, China, Singapore and India. The sample size across these markets was 750 respondents per country with minimum quotas of 250 in Beijing, Hong Kong, Shanghai, Chennai, Delhi and Mumbai. There were minimum quotas of 375 in Brazil for Rio de Janeiro and Sao Paulo.

In addition, the Future Foundation's proprietary global insight tool, nVision, has been used to provide some context and background to the data.

We are grateful to the following experts who gave their time freely and provided invaluable input into this report:

- Sandra Baer, Cities Director, Smart Cities Council
- Wagner Colombini Martins, President, Logit Engenharia Consultiva, Brazil
- Jesse Berst, Chairman, Smart Cities Council
- Shreya Gadepalli, Regional Director (India), Institute for Transportation & Development Policy
- Oren Thatcher, Principal, OTC Planning & Design, Hong Kong
- Michael Replogle, Managing Director for Policy and Founder, Institute for Transportation & Development Policy



Executive summary

We think of globalisation as a force that is primarily commercial. It's impact is most keenly felt by corporations and then by citizens. We argue here that globalisation, and the competitiveness that comes with it, will shape cities, commercially, politically, socially and in terms of their design and growth. As corporations compete globally, so do cities. The future prosperity of citizens can only be secured if a city functions well; if workers can get to their offices and if people find the city an attractive destination for work or leisure.

Ease of mobility within cities is key. The potential of cities is being unlocked by greater ease of movement; innovation in payments and mobile internet allow native populations to make less congested and faster journeys, while visitors are less intimidated by complex public transport systems.

The consequences are far reaching – travellers will be encouraged to use public transport, congestion will be eased, the anxiety around having the right ticket (and the expense of having the wrong ticket) will be reduced, there will be greater exploration of cities and the quality of urban life for visitors and residents alike will improve. Ultimately, innovation in payment technology will help shape the cities of the future through the thoughtful application of data.



- The pace of urbanisation demands urgent solutions; in 1951, India had only five cities with a population of more than one million. There are now at least 53 cities with a population of more than one million residents and three above ten million.¹ The new cities in China and India are creating templates for the development of all future cities.
- Traffic congestion arising from the use of private cars has become unsustainable. In emerging markets it is inevitable that cars will be taxed and regulated to curb their use.
- Cars themselves must adapt. Our data shows that a majority of people in the five countries we surveyed are interested in self-driving cars.
- Instead of thinking of cars as personal possessions, more and more people will come to share cars.
- Bus Rapid Transit (BRT) is emerging as a cost-effective solution to mass transit for many emerging economies. While western countries have traditionally had a preference for rail, the success of BRT in emerging markets is questioning the wisdom of investment in trains and metros.
- BRT can only work if all aspects of the journey are fast – there must be either pre-payment or contactless payments if buses are to be boarded quickly.
- The provision of real-time travel information is key to encouraging the use of public transport over private – 66% of urban Chinese would value a smartphone app that would provide travel updates for leisure trips.
- Pre-payment and contactless payments offer operators greater flexibility over the pricing of travel. This will allow passengers to be incentivised to travel outside peak periods. A majority of people in Brazil, India and China welcome more flexible pricing structures.
- Between 70% and 90% of urban populations in Brazil, India, China, Singapore and Hong Kong want a service that monitors their route and suggests alternatives should delays occur.
- Only a minority (less than one in five) do not want to share their behavioural data with the local government in order to receive better transport services.
- Modern payment systems make intermodality more attractive to travellers. This is critical in easing congestion.
- Modern payment systems improve the business efficiency – and fairness – of public transport by providing subsidies to poorer workers who rely on public transport, without having to artificially depress prices across the entire service.
- Payment intelligence will shape future cities. The information it yields on journeys provides insight into how the system is used and how it can be developed.
- The design of new cities is built around transport needs. This is likely to lead to intense development along transport corridors.
- A majority of people (more than seven in ten) are interested in mobile services such as recommendations on restaurants and places of leisure, as well as more functional services such as pollution updates.
- The flow of innovation is reversing. The results of smart city experiments in Asia and Latin America are being followed by countries in the west.

Introduction

The urbanisation of the world is happening with such speed that it requires a huge response from policy makers. Last year, the Indian government stated its intention to build 100 new 'Smart Cities' and – in addition – to improve its 500 top cities.² China is also developing new cities at a rate not seen before.

New thinking underpins the development of these cities and this decade will be a pivotal moment for how cities are planned. We can argue that the new cities being built now are establishing a new paradigm for urban living. Many believe that the work being done now will shape cities for the next century and create templates for all future urban development. The pilot phase is over and foundations are being laid for a new generation of cities that will be built around transport, moving people easily from home to work to leisure. Through thoughtful planning and the intelligent application of technology, the time lost to congestion and travel delays will be minimised.

These new cities are not just a pragmatic response to technology and urbanisation, they are weapons in an economic war:

"I think that one of the things that really happened in 2014 was a lot of policymakers and city leaders woke up to the fact that Smart Cities are not just about lifestyle, not just about health, not just about convenience; they are about competitiveness and – if you think about the 21st century digital economy – smartness is not just a nice-to-have, it really is essential. You can't be globally competitive without a really strong foundation of telecommunications, of clean, reliable energy and some of the other core components of the Smart City."

Jesse Berst, Chairman, Smart Cities Council

Smart Cities needn't be new cities and indeed there's no accepted single definition of what a Smart City is.

"All cities have the opportunity of being smart. Smartness is not about constructing new infrastructure, smartness is an approach of how to be."

Shreya Gadepalli, Regional Director, Institute for Transportation & Development Policy, India

What is clear is that the future prosperity of nations depends on the efficiency with which its cities – new and old – function. No city will thrive while its workers are stuck in traffic or waiting for a train. Globalisation means that cities compete with other cities; not least in terms of attracting talented people:

"...this latest generation of workers is exceptionally mobile and they often think about where they want to live first, only then who they are going to work for."

Jesse Berst

In this report we look, in particular, at the development of Smart Cities in the key emerging markets of China, India and Brazil. Already dynamic economies, these countries have the opportunity to accelerate their competitiveness through building efficient and liveable cities of the future; places where people and corporations will prosper.

Overcoming urban challenges

One of the greatest urban challenges is congestion and the inefficiency that it brings to citizens, corporations and governments.

Congestion – and the productivity hit that comes with it – is moving transit systems up the political agenda in emerging economies.

“Decision-makers don’t like to be sitting in traffic, so they see the urgency from the back seat of their chauffeured car and it doesn’t matter how many sirens they have as they try to plough their way through, they are sitting in the same traffic as everyone else.”

Oren Thatcher, Principal, OTC Planning & Design, Hong Kong.

Mr Thatcher goes on to explain that policymakers try to do right by their electorates and that they understand that the issue is not just one of congestion and competitiveness, but also of pollution and public health.

In India, Shreya Gadepalli also identifies traffic reduction as a leading priority in the development of more competitive and more liveable cities:

“Indian cities are facing severe traffic congestion at fairly low levels of car penetration. Less than 10% of trips are by personal cars at present. If we take no action, car trips will double in the coming decade. There is no way our streets can handle that traffic. We have to dedicate part of the street to more efficient modes – like bus rapid transit – and, simultaneously control personal motor vehicle use.”

Ms Gadepalli believes that increased parking charges and congestion charging – of the type familiar to Londoners – is inevitable.

In Brazil, Wagner Colombini Martins, President of Logit Engenharia Consultiva, Brazil, has drawn a similar conclusion about the future of private car use.

“...parking restrictions and less space for cars ... tax on petrol and congestion charging; these are policies that are necessary to create a more sustainable development of a transportation system.”

Michael Repogle, Managing Director for Policy and Founder of the Institute for Transportation and Development Policy, is of a similar mind.

“I think there’s an opportunity for deliberate choice to be made, to move towards public transport, walking and cycling, but it’s not the direction trajectory that we’re currently on in a forceful way.”

Mr Repogle points towards Singapore as a city that has grasped the issue, introducing regulation and taxation to curb car use. In Colombia, Bogota, Cali and Medellin have all introduced measures to curb car use.

The direction of travel seems irresistible:

“...there are eight or more cities in China that have adopted limitations on motor vehicle registration along the same lines that Shanghai and Singapore have done. This has spread to Guangzhou, Beijing and some other cities.”



Has the attraction of car ownership stalled?

As car ownership becomes increasingly expensive and regulated we might wonder if the car has a future in Smart Cities.

Future Foundation data shows that many people are choosing alternatives to travelling by car:

Those who claim to be walking, cycling and using public transport more than they used to instead of travelling by car among the online and urban populations of selected emerging markets³

	Brazil	China	India	Mexico
% claiming to have increased walking, cycling and public transport use	59%	65%	59%	66%

These are high percentages. What is interesting is that the proportions of people agreeing with this statement don't vary much by income. In India, 59% of our respondents say they are using cars less often for journeys; among the highest earners (INR 65.7k + household income) the proportion agreeing is barely different at 60%. The same pattern is repeated in Brazil and China. Clearly, the fall in the oil price may encourage more journeys to be made by car. However, it also seems likely that many have been motivated to use other forms of transport because the car is inefficient in terms of time use as well as cost. There is also a health dimension in this as more people are made aware of the benefits of exercise.

Another factor is a shift in attitude among millennials. In the United States in 1983, 87% of 19-year-olds had a driving license. By 2010, the proportion had declined to 69.5%.⁴ In the UK the pattern is similar – in 1995/97, 43% of those aged 17–20 held a full license, compared to 36% in 2012.⁵ In Germany there has also been a decline in the number of young people with a license. The reasons for this are manifold – the rising cost of motoring being prime among them. However, there is also some evidence to suggest that younger people feel differently about cars now – that they are not the symbol of freedom that they once were. In the case of the UK, increasing numbers of young people are using public transport. Britain's Association of Train Operating Companies has reported a significant increase in the number of young people using a 16–25 railcard. Given the rise of zipcar and other urban car rental schemes, owning a car may now seem a less attractive – and less necessary – option.

In emerging markets there is a tension between individual freedoms and the need to avoid gridlock. For an emerging middle class the car is a potent signifier of status.

"There is no doubt that a car is seen as a status symbol. At the same time Indians are also very money conscious," says Shreya Gadepalli. People may buy cars but use them less if its cities make their use expensive, through parking fees and congestion charging.

Emerging middle classes offer a huge opportunity to car manufacturers and most have seen significant growth in countries like China and India.

The benefits, particularly the emotional benefits, that a car offers are not easily resisted. It is clear that the tensions between personal freedom and less congested cities are not easily resolved. The role of the car will change in a number of ways. First, through redefining what ownership means:

"I think that cars have to become much more resource efficient... Take car2go or zipcar, they are great car-sharing services for individuals. One car can often replace five or more cars that would otherwise have to park somewhere downtown and would be putting out pollutants when they were there. But that same fleet management software – being able to remotely unlock a car and to know where it's going and where cars need to be – that works for a city's fleet as well. We're seeing dozens, hundreds, of cities using the same software as zipcar or car2go to manage the city fleet..."

Michael Replogle

"The best way of going forward is to look at cars as a shared resource rather than as an individually owned asset. Use cars when needed, but not for daily commute."

Shreya Gadepalli



Has the attraction of car ownership stalled? continued

“I think you’ll see use of incentives for drivers to use smartphone systems like Uber and Lyft to have another option to driving alone – they’ll have an option to help fill empty seats in the car. If they are driving for a trip and they want to save money they’ll have a chance to do so by offering those seats to other travellers who need a ride. People will probably get discounts in road-user charges or parking charges if they are willing to pre-schedule their trips and have flexibility about when they start their trip or what route they take in the network to reduce congestion.”

Michael Replogle

Second, through making cars smarter.

The supercharged pace of change in car manufacturing is unprecedented as this year’s Consumer Electronics Show in Las Vegas demonstrated. An Audi A7 arrived at the show having completed a 560-mile journey from California. For much of that journey the car drove itself.

Interest in various car innovations:

	Brazil	China	India	Singapore	Hong Kong
A car that reprogrammes your route to avoid congestion	87%	89%	89%	71%	72%
A car that drives itself	73%	77%	82%	61%	65%
An in-car device that allows you to pay for petrol automatically	81%	75%	85%	59%	56%

“Every kind of mode [of transport] is going to get smarter and so I think that cars will play a part here and certainly the driverless car, the car that enables you to be productive while you’re in transit, will continue to be important...”

Sandra Baer, Cities Director, Smart Cities Council

Cars remain largely unconnected environments, the one place where people can’t access the internet directly. One of the reasons that so many support the idea of a driverless car is that it would free them from the often monotonous job of piloting a car and allow them to use the time more constructively either for work or leisure.

Third, some drivers will come to recognise that, while expensive, the new fiscal and regulatory regimes are inevitable and do yield some benefits for themselves:

“Drivers will end up paying more under such a system but they’ll be stuck in traffic much less and the majority of people, especially in developing countries as we go into the future, will be increasingly stuck in traffic unless we adopt these Smart City systems.”

Michael Replogle

Payments have an important role in managing the use of cars in urban areas. In India, Shreya Gadepalli believes that using private cars will be discouraged:

“There is no other way forward than parking charges and congestion pricing – I think we are on the cusp of these ideas being adopted by many Indian cities. The National Urban Transport Policy – adopted almost eight years ago – has a stated position that [prioritises] moving people, not cars.”



Bus lane becomes the fast lane

A consistent theme among the experts we spoke to was the importance of high-speed bus services.

"I would say that Bus Rapid Transit (BRT) is emerging as a cost-effective alternative to investment in heavy rail. It's a very good solution for certain cities. It doesn't have the sex appeal of rail-based transportation and that's one of its problems – politically, mayors like rail. Where it has been installed ... it's been a very successful and popular type of infrastructure. It's an important new approach to planning mass transit."

Oren Tatcher

Buses offer a number of key advantages, not least in being much cheaper to introduce than new railway lines. They are also flexible, scalable and can reach every corner of a metropolitan area. However, they only attract passengers if they can offer journey times that are not much slower than other modes of transport. Bus Rapid Transit was developed to do just this.

Brazil exemplifies the benefits of BRT.

"[BRT] is a phenomenon in all countries in the developing world; it's starting now in the United States, in China, in France and in the UK. As metros are very expensive I don't think we'll see too many here [in Brazil]... I think BRT is going to happen in the future more and more. In Rio de Janeiro, two BRTs are already operating and a third and fourth BRT corridor will be ready for the Olympics. One of them will carry more than 50,000 passengers at peak times. Bus systems like BRT are going to prevail in the developing world I think."

Wagner Colombini Martins

In India, BRT is a huge opportunity and a better option than rail. According to the Institute for Transportation and Development Policy, seven months after the Ahmedabad BRT opened, 34% of commuters had moved from private transport to the buses.

"The traditional western approach has been hugely rail-based, whether it be subways or elevated rail or even surface rail. Instead, we hope that India will make a smarter choice of using buses which are more flexible and can bring people closer to their homes, offices and places of recreation. They are also cheaper, a lot cheaper. Our push is to promote ideas like Bus Rapid Transit which are metro-like services, providing the same quality of service, the same capacity of service, but at a fraction of the cost."

Shreya Gadepalli

The success of BRT in Ahmedabad has encouraged other Indian cities to adopt BRT; Pune and Pimpri Chinchwad are currently working on new BRT systems while other cities such as Chennai, Coimbatore, Nashik and Bhubhaneswar are conducting feasibility studies.

Speeding up buses is in large part achieved through infrastructure improvements – the creation of corridors that prioritise buses over other traffic, with different rights-of-way and traffic lights that give priority to buses. While this improves the average speed of the bus while it is on the move, there has also been innovation around speeding up the sometimes lengthy boarding and payment processes. The point of BRT is completely undermined if the payment process increases journey time.



Bus lane becomes the fast lane continued

"[Pre-payment or contactless payment] can increase the average speed of public transport significantly and we see that as Bus Rapid Transit systems are growing in number. Several hundred cities in the developing world, cities like Bogota, Guangzhou, Ahmedabad and Cape Town all have Bus Rapid Transit with fare pre-payment."

Michael Replogle

BRT avoids two thorny problems. First, as Oren Thatcher points out, there are plenty of very expensive, under-utilised, white elephant rail systems around the world. Being more flexible and less costly, BRT routes and services are more easily fixed should mistakes have been made in the planning process. The second issue is more political and involves the amount of time that it takes to construct rail-based infrastructure.

"...most of these [big infrastructure projects] happen outside normal political cycles of democracies so you can initiate a project but you don't get to cut the ribbon often. Politicians don't like that, they don't like their successor cutting the ribbon of a project that they fought to launch and paid the budget for."

Oren Thatcher

Buses are only rapid when every aspect of their use is rapid; payments have a critical role to play.

Technology improves the travel experience

There is nothing smart about a difficult journey across town. The potential in cities is unlocked through effective, easy to use, public transport.

Mobile devices offer a means to travel more efficiently, particularly if the city provides services that help visitors and residents. Our data shows that consumers have a huge appetite for services that help them make journeys.

How interested would you be in a smartphone or tablet app that provided real-time travel updates?

	Brazil	China	India	Singapore	Hong Kong
Interested for business travel	55%	56%	64%	40%	46%
Interested for leisure travel	62%	66%	58%	57%	74%

Many people have concerns about privacy and these tend to be heightened when using mobile internet. The data breach affecting Octopus users at MTR in Hong Kong some years ago provides an example of where privacy can be compromised. However, the benefit of making easier and faster journeys, of travelling seamlessly, is simply too great to ignore:

"I think by default people assume that these sorts of technologies [Octopus] are being protected, but convenience trumps everything."

Oren Thatcher

Technology has a particularly important role in intermodal transport. Travellers are dissuaded from making journeys if they have to change stations or their mode of transport.⁶ This is an obstacle that planners must address if more efficient journeys are to be made across cities by public transport and if car use and congestion in the heart of cities is to be reduced. Drawing on his experience of planning intermodal transportation in and around Hong Kong airport, Oren Thatcher describes the positive role technology can play:

"I do think that information can facilitate a much more efficient use of transport resources... networks can provide information about the availability of seats and so on, so that people make more informed decisions in their daily commutes or incidental commutes. That would go a long way towards both improving experience and optimising resources."

Oren Thatcher

Mr Thatcher believes that Tokyo is the exemplar of intermodal transport and has a model that can be copied by other cities:

"...the only thing that's really missing on these sorts of information systems [Tokyo public transport] is the extension of GPS to locations within a building and that's a technology which I believe is coming. Transponders inside the building will communicate with your smartphone. That would improve a lot the way people move between train and bus, giving you better directions on where to go, not just on transport but in general."

In India, Shreya Gadepalli believes that the provision of accurate, real-time information is critical to encouraging people to move from private to public transport:

"...the only way choice users [those sufficiently wealthy to be able to choose how they travel] will take public transportation is if it is a relatively seamless affair."

Anticipating city living in Asia in 2025, Michael Replogle comments:

"I think the next 20 years will be a time of intense change in the surface transportation sector with a much greater use of information, communication, telecommunications and smart systems in transport for better management of information about where transportation vehicles are and ways of keeping them on time; helping passengers to know when the next vehicle will arrive. Helping travellers to know what their travel options are, what they'll cost and then developing better payment systems to manage traffic in real time."

Mr Replogle points to the development of GPS and GTFS (General Feed Transit Specification) systems to create dynamic maps of public and private paratransit systems in Nairobi as a harbinger of what is to come.

"[GPS and GTFS] have been used in Nairobi and some cities in China, India and elsewhere to create public transport maps that include the paratransit and informal transit systems for the first time."

The benefits of this type of technology are twofold. First, it empowers passengers by giving them information that allows them to make better decisions and journeys. This encourages the use of public transport by making the experience, if not seamless, then at least easier. These systems put travellers in control of their journeys and will encourage the use of public transport over private. Second, these systems provide a wealth of intelligence to operators, giving them the insight required to provide better services. Governments and local authorities will learn how to manage traffic and allocate street space, aiding the planning process. Ultimately, the data will enable better management of the public transport system and concessioning. Mr Replogle gives the example of Singapore as a city that exemplifies this information-rich approach to transit planning and it's important to recognise that many other cities are innovating in this area.

There is also energetic innovation around fares. New technologies allow fares to become dynamic rather than fixed and can help ease congestion by incentivising travel at different times.

"We also see a lot of innovation in fares, in terms of how public transport fares are collected with the use of common fare media that can be tied to a bank account or credit card account that can be used for contactless payment of bus and railway fares, parking fees, road user charges..."

Michael Replogle

Travellers – certainly those familiar with internet commerce – are likely to feel comfortable with this idea. Generally e-commerce has introduced people to the notion that price is not always fixed; it is dynamic, moving up and down with the seasons and with demand. Dynamic pricing has a critical role to play in transit; it can encourage travellers to plan their journeys better and congestion can be eased through incentivising journeys outside of peak periods. It can also be used tactically – if a large event (such as a concert or football match) is causing congestion on some routes, alternative routes can be promoted through flexible pricing. When transport operators flex price, consumers are likely to be receptive and many will play the system to get the best deal.

Thinking about all the journeys you make around your city which of the following services would be useful to you?

	Brazil	China	India	Singapore	Hong Kong
A service that offers a range of prices for travel at different times of day (e.g. cheaper prices at different times of day)	62%	62%	57%	37%	52%

As well as an interest in dynamic pricing, consumers are also promotionally sensitive. Incentives provided by retailers or payment providers can be effective in swaying the purchase decision. As payment systems proliferate, those that offer consumers an incentive will have a competitive advantage. For some consumers, incentives and promotions are not just desirable but an essential requirement for purchase; for example, 50% of Indian consumers would switch brands if their normal brand stopped offering promotions. Consumers expect internet shopping to be cheaper than offline shopping and therefore consumers anticipate savings through transacting online.

I specifically look out for promotions when shopping:⁷

	Brazil	China	India	Mexico
% agreeing that they search out promotions while shopping	75%	76%	73%	51%



Incentivisation

Enrique Penalosa is the Mayor of Bogota. The Colombian capital is routinely held up as an example of a city that is managing transit imaginatively and well. Mr Penalosa is on record as saying; “an advanced city is not one where even the poor use cars, but one where even the rich use public transport.”

In a growing number of cities there is now a drive to make public transport the only transit option. While fiscal measures and prohibition are means of pushing citizens from cars to public transport, a more progressive approach is to incentivise public transport. This can be achieved through making booking and paying for transport simpler – often by public and private companies working together to create solutions that offer speed and convenience to the traveller. Bogota’s TransMilenio BRT is a shining example of the success of the Latin American approach to bus systems. Part of the popularity of TransMilenio has come from the means of payment – a smartcard. This brings speed and convenience to the experience – an experience which is about to become easier as Bancolombia announced in February that they have partnered with MasterCard to create a debit card with transit functionality across the Integrated Public Transport System.

Receptiveness to technology

The most sophisticated information system is only valuable when substantial numbers of people use it. Our figures here show that, among urban and online populations, the smartphone is a near-ubiquitous device. Around a third of the Chinese and Indian sample already use travel apps at least once a month.

Smartphone ownership among the online and urban populations of selected emerging markets:⁸

	Brazil	China	India	Mexico
Smartphone ownership %	72%	95%	81%	87%
Percentage who use travel apps at least once a month	18%	34%	37%	21%

As we look to the future, what is the appetite among residents for proactive travel information? Speaking about Brazil, Wagner Colombini Martins is confident that the population will welcome these technologies and points to the success of Waze as evidence of the demand for travel information. It is not just drivers who benefit from the information generated through the Waze network. During the 2014 World Cup, the Brazilian government used Waze to analyse traffic flows and congestion in an effort to keep the city on the move.

Waze is indicative of how consumers are coming to use social networking for increasingly specific and practical applications. In China, 44% of the online, urban population have used a specialist online forum; in India the figure is 38% and in Brazil 49%.⁹ The implication is clear: if cities and transit authorities do not provide their own information services then residents start filling in the gaps by themselves.

Our new research for MasterCard indicates very high levels of interest in a travel service that monitors your route and advises on suitable alternatives should delays occur.

	Brazil	India	China	Hong Kong	Singapore
Very interested and quite interested	85%	90%	77%	77%	71%

When they experience the benefits of new technologies in payments, consumers’ fears will largely be overcome. However, there is another issue to address:

“I think the big challenge is over-allocation of street space and over-pricing of transportation. There is a tendency in the world towards populist ideas ... and to be distrustful of government and large institutions to manage systems and to meet welfare goals as smart systems could do.”

Michael Replogle

In other words, city residents may have more faith in smart systems operated using Big Data resources than they do in national and local government running public transport. For some decades now there has been a global trend towards citizens being less deferential to government and elected leaders. For a variety of reasons, including corporate and government scandals, trust in traditional sources of authority has been in decline globally. In this instance, Mr Replogle believes the distrust can be overcome as the experiments being conducted now in designing and operating smart transit systems create successful templates that can be rolled out to other cities. Once drivers, cyclists, motorists, pedestrians and those using public transport see the benefit of new smart approaches to managing transit they are much more likely to accept them. There is a considerable political challenge in this area but in the long term travellers will adjust, recognising that faster journey times can only come from restricting some freedoms and allocating space for the benefit of everyone rather than the few.

We can examine this by using the critical dimension of whether residents would be willing to share their own data with local governments or third parties:

Residents stating that they would be happy to share behavioural data with local government or a third party in order to gain the following benefits:

	Brazil	China	India	Singapore	Hong Kong
If travel was improved in my city (e.g. faster journey times)	49%	59%	53%	46%	50%
If broad improvements were made to the city's infrastructure (even if it didn't effect me initially)	50%	60%	52%	44%	47%
If it meant I could save money (e.g. cheaper travel around my city)	43%	59%	55%	46%	50%
I would not want to use my behavioural data in any circumstances	19%	8%	13%	14%	18%

Perhaps the most telling response is that only a minority of people (less than one in five) would not consider sharing data. Given current sensitivity over privacy, this is a potent indication of how receptive residents are to the benefits that technology brings. Once populations see the benefit of sharing data reflected in easier and quicker journeys, we might expect to see the number of people refusing to share data to decline further.

Some public authorities have recognised that citizens may feel uncomfortable about the amount of data that is being captured and processed by planners and local government. They have responded to this through open-data initiatives which make the data publicly available. Bristol and Manchester in the UK are examples of cities that have adopted this approach. Citizens can access the data the city holds on parking, procurement and planning. The logic is clear: if the creation of municipal data sets has been funded by taxes on citizens, then citizens ought to have the right to use them.¹⁰



Payments

How we pay for transport has a critical impact on how we use transport. Simpler payments means faster and easier travel. Beyond that obvious benefit new payment systems offer multiple advantages for all the residents of a city.

Use of bank and finance apps among online and urban populations among selected emerging markets:¹¹

	China	India	Brazil	Mexico
% of population using a banking or finance app at least once per month	55%	37%	34%	25%

Michael Replogle argues that new payment systems are unlocking innovation in how transport systems can be operated in real time. Patterns of demand are established and prices can be adjusted to manage flows; we’ve seen that consumers are responsive to flexible pricing. It also provides a more seamless experience for residents and a less intimidating environment for visitors. It is likely that modern payment systems will encourage visitors out of taxis and on to buses and trains if they do not need to navigate complicated fare systems.

“[Payment systems are] extremely important for intermodality [changing from one form of transport to another] because of the ability to rationalise transit choices without concern for double charging. Smart charging technology has to be facilitated through a kind of infrastructure. I think that would improve consumer choice (it would help passengers make more rational choices) and I think it would also allow operators to participate in these sorts of systems if they had the confidence that there was a fair sharing of the revenues, and that’s something that doesn’t exist in many places today.”

Oren Thatcher

There are other social goals that can be met through more sophisticated (and yet easier to use) payment systems.

“It [modern payment systems] can provide the backbone to enable user-side subsidies that are means tested as opposed to having public transport fares kept artificially low in an effort to subsidise low-income travellers who are dependent on public transport. There’s a lot of research showing that user-side subsidies, as opposed to general subsidies, are much more efficient in enabling the provision of high-quality public transport services that also better serve low-income people.”

“Developing innovations in fare media and more common use of pre-paid fare instruments is a key to unlocking a lot of innovation.”

Michael Replogle

In a globalised world, standardisation in payment systems is key. This will enable visitors to cities to travel freely and with confidence. Innovation in countries like India around mobile wallets is encouraging global payment providers to acquire local players, thus combining global reach with local solutions. C-SAM, based in Vadodara and ECS, based in Pune, are both examples of highly innovative indigenous companies being acquired by globalised payments companies (in this case MasterCard).



At a more strategic level, the state government of Gujarat signed a memorandum of understanding with MasterCard this year for strategic cooperation to accelerate the adoption of electronic payments in a number of areas including transit. The state government has declared the intention of being the first digital payments state in India. A key part of their ambition is a common transit card that works across the metro, as well as both state and local buses.

Mobile payments are set to grow dramatically in India due to the significant support provided by the State. In the third quarter of 2014, there were 18 million new mobile phone connections. Mobile phone subscriptions are growing at 15% annual compound growth rate. By 2020 there should be over 6,000 million smartphones being used (up from 2,700 million in 2014).¹²

Payments will also come to have a very significant role in strategic planning. Insight gained from payments can shape cities.

“[Payments]...it actually goes well beyond transit, when you know where people are coming from, where they’re going and where they’re stopping ... that has a lot of implications for other aspects of city life. Where should you put your new housing development? Where should the retail store go? Those kind of things.”

Jesse Berst

This is Big Data applied to the development of cities. Without always realising it, travellers are providing a wealth of data on how they move around, where the pinch points are and where they enter and leave the system. This data not only informs the work planners who are doing online modelling, it is also shaping the cities of the future, cities that are built around people and what their needs are.

Uptake and interest in making payments by mobile phone among urban, online populations in selected countries:¹³

	China	India	Brazil	Mexico
% who claim to be using mobile phones to make payments	41%	32%	15%	19%
% who have not paid for an item using a mobile phone but would be interested in doing so	47%	44%	56%	57%



Infrastructure shapes new cities

Payment intelligence can provide input into planning the cities of the future. It is becoming invaluable in the planning of infrastructure. Much of the thinking in planning new, smart, cities is based around infrastructure; building cities that are easy to travel through and live in. China provides some of the best examples. The new city of Chenggong is a case in point. At one point it appeared as if the city would become a vast, empty ghost town; 100,000 apartments stood empty. The first design for the city was on a traditional western format that included multi-lane roads and multi-storey apartment blocks radiating out from a central business district in the heart of the city. That thinking is now being replaced by a new approach of creating mixed-use spaces where residential property and office space are combined. The transport links and roads are on a smaller scale which encourages walking and space for a community to socialise. Extensive public transport allows easy access to other parts of the city.¹⁴

Another of Chenggong's problems was its remote location – one which was poorly served by transport links. China has put considerable investment into connecting cities by high speed rail.

“... in China I see a real paradigm shift – even though it's a work in progress – the high-speed rail network. This is truly impressive; the extent of it, the speed with which it was built and what it's going to do. A huge country where mobility was extremely challenging has suddenly become very small and relatively within the reach of the average person. [High-speed rail] is much more revolutionary in China than what I see happening in urban transport.”

Oren Thatcher

In other countries cities are being built around transport infrastructure. In India there is a highly ambitious plan to develop an “influence zone”; the Delhi-Mumbai industrial corridor which features high-speed transport to link the hubs together. The corridor also features the creation of a new city – Dholera – which may ultimately be twice the size of Mumbai.

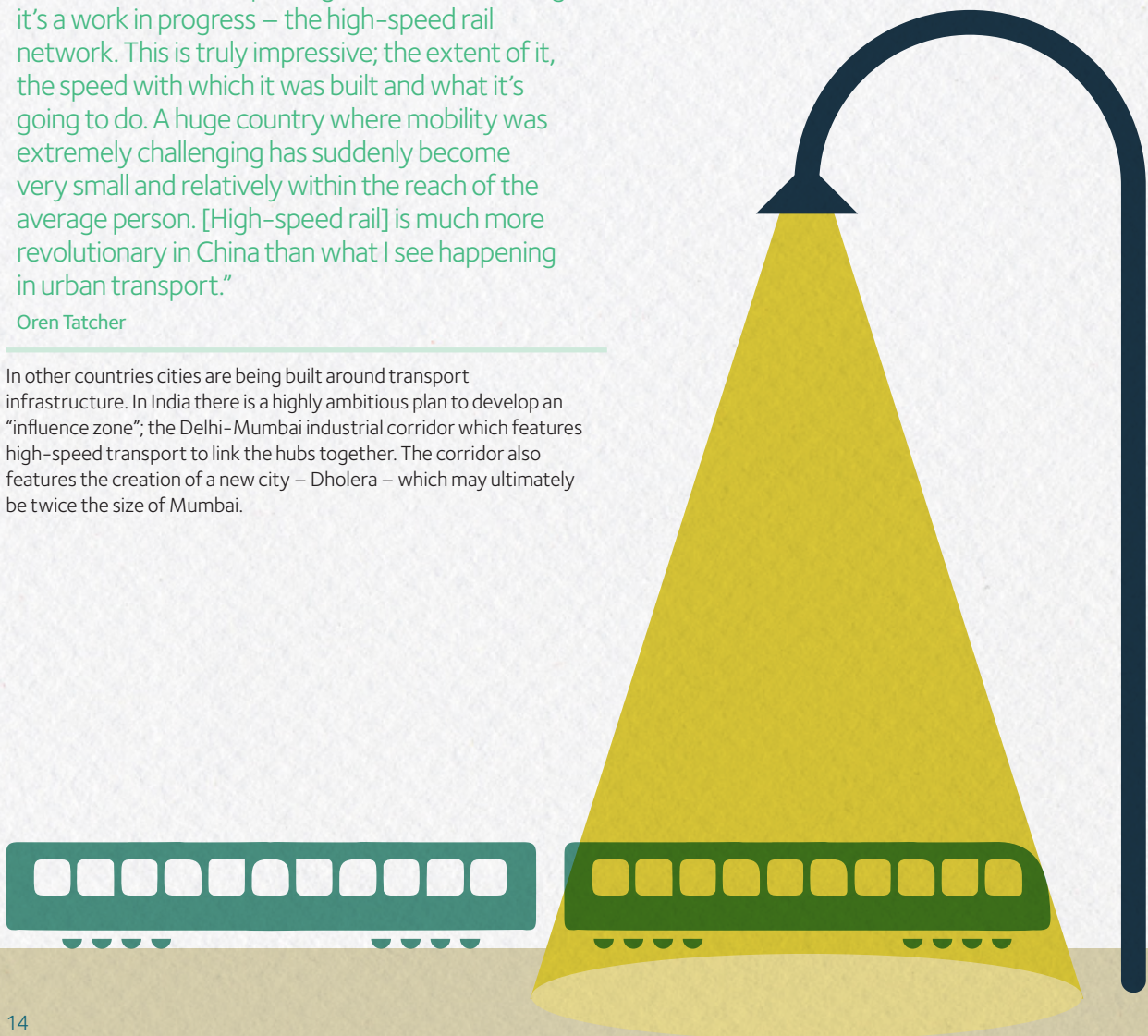
Globally, the process of transport-orientated cities is causing intensive development along transport corridors and around stations. Close proximity to good transport links pushes up property prices and commercial rents, to the considerable benefit of developers. There is now a move towards developers contributing towards (rather than just profiting from) public transport.

“Currently we have some metro stations here in São Paulo with huge developments in commercial use and they pay rents to the metro.”

Wagner Colobini Martins

Mr Martins believes that future transport-orientated development should require developers to share in the cost of providing public transportation. He mentions Tokyo as an example of a system in which the public transport operator gets the majority of its income from non-transportation services.

An influx of capital from developers would help cities build better infrastructure while residents benefit from high-quality transport links.



High density developments around transport links have an attraction for younger residents:

“... younger generation seems to want to have a walkable lifestyle and they seem to appreciate the density of a downtown area, the density of entertainment options, the density of cute people to date, the density of job opportunities and so on. It does seem likely that in some parts of the world we'll see regional clusters ... I do think we'll see some of these secondary downtowns pop up as well.”

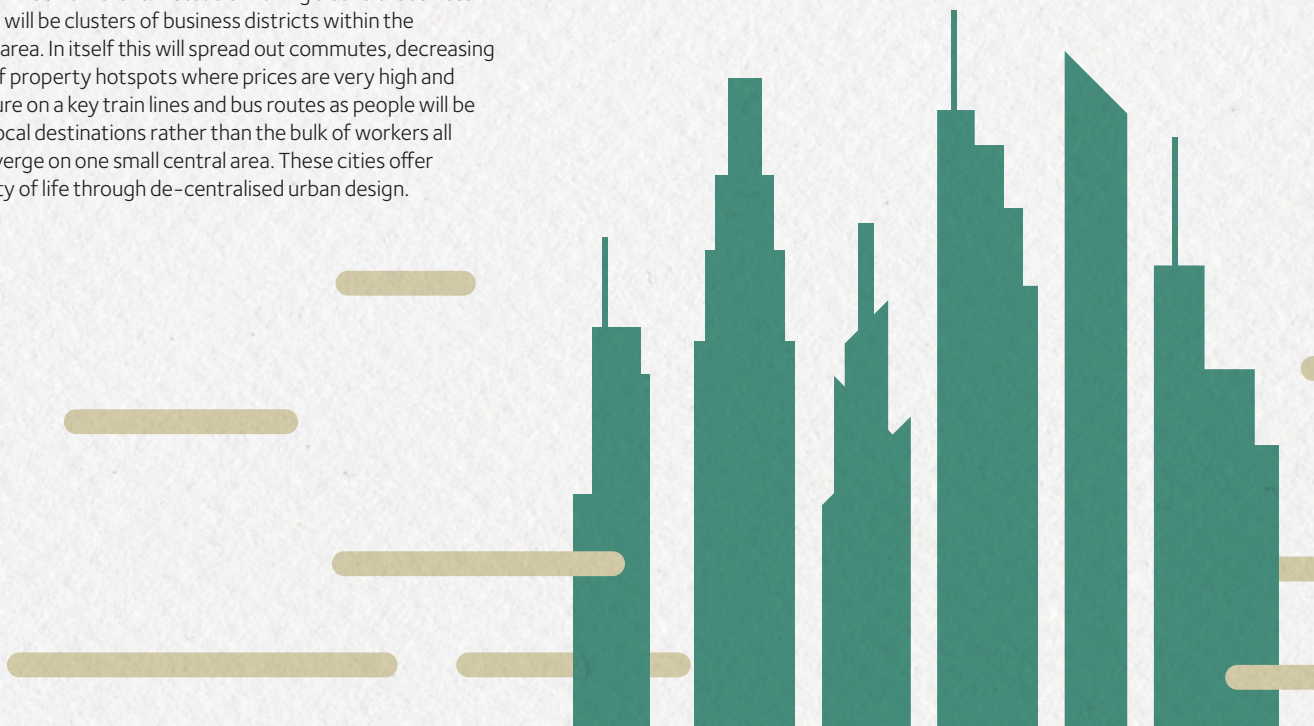
Jesse Berst

In India the Institute for Transportation and Development Policy states that its eight principles of development are being followed in the construction of new cities and sub-cities. These principles are being employed in developing Ahmedabad for instance. The principles include encouraging walking, promoting cycling, locating dense developments near transport facilities, mixed use of land and the creation of regions with short commutes.

“Many of the issues, like having block sizes right, urban guidelines etc have already been embedded. It's a human interface-based approach. Technology comes next, as an enabler.”

Shreya Gadepalli

Future cities will look different. Instead of having a central business district, there will be clusters of business districts within the metropolitan area. In itself this will spread out commutes, decreasing the number of property hotspots where prices are very high and reduce pressure on a key train lines and bus routes as people will be travelling to local destinations rather than the bulk of workers all trying to converge on one small central area. These cities offer a better quality of life through de-centralised urban design.



How residents interact with their city

The term “going online” seems increasingly antiquated. The internet has become untethered, the consequence being that we are permanently connected. Mobile devices provide a constant, unbroken, connection to the internet. For brands and service providers the consequence is obvious – internet services must be optimised for mobile devices. Simplicity and ease-of-use are key. So increasingly is spontaneity, as individuals use the internet to solve immediate problems while navigating through cities both known and unfamiliar.

In social networking there is already a preference for mobile platforms – in China 40% of those with a tablet, smartphone and laptop use their phone to check their favourite social networking site.¹⁵ Among multi-device owners in India as many people use a smartphone to check email as a desktop or laptop.¹⁶

This preference for mobile connection creates an expectation for ever-more sophisticated and helpful services. So much so that many are impatient for improvements from service providers and there is an appetite for more.

City residents agreeing strongly to the following statements:

	Singapore	Hong Kong	Beijing	Shanghai	Chennai	Delhi	Mumbai
The local government is using new technology and it is already improving city life	16%	10%	16%	24%	23%	23%	23%
Progress is being made to make improvements in my city using new technology but the local government could do more	16%	18%	24%	31%	27%	28%	34%

That latent demand for mobile help is evident in the interest that people have in a range of new mobile services. Interacting with your city would be a great deal easier if real-time and location-sensitive services helped travellers navigate their way around both the unfamiliar and the new. Service providers can help with basic and functional needs of course, but there's also an interest in rediscovering the city through being recommended new places to go. While this is not entirely new, there are some interesting innovations taking place. Most recommendation services use a consumer's past history and preferences to recommend new places that they might enjoy. While this is useful it tends to drive travellers to experiences that are already familiar. There is a predictability to location-based recommendations. What's missing is serendipity. This weak spot is being addressed by a new wave of innovation aimed at pointing travellers towards new varieties of experiences that they have not had before but might still enjoy. Yahoo Labs in Barcelona provide an example with their mapping service which provides users not with the fastest route from A to B, but with the most

scenic and attractive route. This type of technology promises to make travel more exciting, inspiring and interesting. It reinforces the position of the smartphone as an indispensable travel companion (even among those who might not believe in itinerary making).

Residents who are quite interested and very interested in a range of mobile services:

	Singapore	Hong Kong	Beijing	Shanghai	Chennai	Delhi	Mumbai
A service that identifies your location and recommends new bars, restaurants and leisure options in your city that you might like	66%	69%	86%	84%	84%	85%	87%
Updates on pollution levels in your city	65%	65%	85%	88%	89%	83%	83%

The usefulness of a smartphone in making travel easier and faster is underscored by the proportion of city residents who have an interest in using a phone for specific travel purposes. In 2011 research conducted by IBM found that Beijing and Shenzhen had the most wretched commutes in the world, after only Mexico City.¹⁷ There has been a recognition that travel needs to be improved in Chinese cities and this has led to a new set of mobility priorities. Both Shenzhen and Beijing are restoring cycle lanes for example. The interest that our sample shows in using a phone to book bike and car sharing schemes indicates that these options will be welcomed.

Residents who are quite interested and very interested in a range of mobile services:

	Singapore	Hong Kong	Beijing	Shanghai	Chennai	Delhi	Mumbai
A service that allowed you to pay for small items (such as a bus or train ticket) using a fingerprint scan	66%	66%	86%	88%	85%	90%	89%
Bike and car sharing schemes that can be booked and accessed via a smartphone	61%	65%	84%	85%	85%	78%	78%

If citizens are to interact with their city it must be simple, immediate, spontaneous and cheap. Mobile technology provides the solution.

Conclusions

“The history of human progress is not a gradual incline, it’s a series of step-changes. We plateau for a while and then there’s some breakthrough and we jump to another level of prosperity and comfort. We’ve done that with cities through steam power and then electricity. The latest step-change is Smart Cities. This is what will bring about the next great boost in prosperity and in liveability. The great thing about it is that it’s also going to allow us to do it in a sustainable manner so that we don’t have to steal from future generations.”

Jesse Berst

Smart Cities help national economies to compete against other economies in a very globalised world. The smartest of Smart Cities is at an advantage – nobody wants to work in a city choked by traffic and wreathed in pollution.

The experimental nature of newly-built Smart Cities will generate ideas for how all cities can operate more efficiently.

In the past innovation, ideas and technology have flowed from west to east as emerging markets play catch-up. However, the strength of the Brazilian, Chinese and Indian economies, combined with the energy and resourcefulness of their populations means that innovation will start to flow the other way. It’s also possible that emerging countries, unencumbered by legacy systems and architecture, can leapfrog western approaches.

“... mobile technology has been so well adopted and is leading the way in many centres both in India and many other geographies. Africa is a great example where mobile technology has allowed financial inclusion for a lot of people ... it’s quite possible that we will leapfrog some of the western approaches to technology. If you look at parking there is a whole history of technologies that require deployment of heavy equipment like single space parking meters that are vulnerable to failure and vandalism. Maybe India has the opportunity to not have physical meters at all and maybe it will all be done through cellular technology.”

Shreya Gadepalli

Western observers agree that innovation is now flowing from emerging markets back to the west:

“Already we have cities in the United States, for example, that are learning from the experience of Brazil and Colombia with innovations on Bus Rapid Transit and these innovations are now spreading to the US and Europe. I think we’re likely to see the innovations of Singapore on road-user charging spreading more widely; already they’ve been adopted in various forms by Stockholm, London, Milan and several cities in Norway. I think ideas from the global south will indeed be spreading to the global north in how to develop smart traffic management.”

Michael Replogle

The smartest of Smart Cities are likely to be in India and China, where planners have had an opportunity to learn from the living experiments of a first generation of Smart Cities. They have the opportunity to build new cities from scratch and these cities will be templates in the shaping and reshaping of future urban development. The next step-change in how we all live is being developed in Asia.

SMARTER
CITIES
CAN SOLVE THIS



Mobility Futures: 2025

Julia

Even after ten years working for BMC, Julia still feels a frisson of excitement in travelling to new countries. As the engines on her Airbus A350 spool down at the gate, she reflects on how the quality of business travel has improved in the last decade. She believes that time efficiency is the greatest single change. Previously, any business trip involved wasteful hours of preparation and research into the city that was being visited. Long hours at the office were the inevitable prelude to any foreign trip and the need to research travel options, arrange foreign currency and understand local payment systems created additional work and distracted her from preparing for meetings with local distributors.

As she crosses the air bridge she powers up her mobile phone. Her travel app uses beacons located within the terminal to identify her precise location and to begin her journey to the Hilton. For a moment, as she passes the seating area where the Currency Exchange used to be, Julia considers that, like the aircraft she has just left, she too is now on auto-pilot, being guided smoothly and effortlessly towards a new destination.

Despite her experience of international sales, Julia is still a bit anxious; this is a new city for her with new distributors and new opportunities. She is grateful that she doesn't need to worry about buying tickets and having to decipher unfamiliar transit maps and connections. The new generation of payment and travel apps have taken much of the anxiety from urban travel as their standardised approach works across all countries; the same, familiar app helps her navigate through Brussels and Beijing. Her phone takes care of all of this, guiding her to the right platform and providing the means of payment. The app also knows that this is a business trip and each travel transaction is automatically recorded on an expenses spreadsheet. The app converts the fares from the local currency into sterling. Her expenses data is already with her finance department.

She negotiates her battered wheelee-suitcase through the metro station. This morning there's a problem in the city – inbound travellers are being delayed by a signalling fault which is causing congestion. Immediately the transit authority alters the fare structure, extending peak hour charges for an extra 45 minutes and cutting the off-peak fare by 25% to encourage travellers to delay their journeys, thus reducing over-crowding. Around her, Julia can hear a myriad of beeps as the fare change is communicated to hundreds of smartphones. Julia considers her options. She could take a driverless taxi into town. Her thumb hesitates over the touchscreen button that will summon the cab. She knows from the app that the price of the cab will be reduced to encourage travellers away from the rail stations and that the traffic lights will now prioritise traffic coming into town, but the cab is still expensive compared to public transport. She is also aware that her finance controller, ever alert to inefficiencies in spending, will be aware that she has taken a slower and more expensive route to her destination. With no meetings until tomorrow, Julia decides to wait 50 minutes at the airport for a cheaper train. She prides herself on being careful with company resources and the fact that, for three of the last five years, her finance department have calculated that she is the most efficient of all Milan-based employees in terms of personal spending. That calculation is factored into her personal cost-of-sales metric.

With an hour on her hands she selects her favourite international payment app. This app is aware of her preferences and past commercial history. It suggests that she might enjoy some of the shops in Terminal 2 – only four minutes away. She accepts this suggestion and walks towards their retail area.



Pamela

Pamela is from Dublin and she is finding Delhi an assault on all of her senses. The noise, the colour, the heat – it's hard to imagine a greater contrast from the quiet streets of Ballsbridge. Despite the bustle and the alien nature of the experience she is enjoying herself thoroughly. She's using a new travel app: *Trust Me!* The point of *Trust Me!* is that it directs the traveller (is there such a thing as a tourist now?) towards unexpected delights. It uses new software to direct Pamela towards things that she did not know she would like. *Trust Me!* describes itself as a serendipity app, using educated hunches to introduce Pamela to experiences that are outside of her normal frame of reference but which she finds unfailingly fascinating. Such as this bicycle shop. In most cities cycling is now a much more appealing option than it used to be. All over the world mayors are introducing segregated cycling lanes in order to cut congestion and pollution (cynics argue that the real motivation is to get populations exercising and to cut down on mounting health care costs attributable to ageing and sedentary populations). Whatever the reasons, bikes have become a symbol of freedom and a means of expression for many. The bike shop is a true delight – fitting old school bikes with the latest navigation and safety aids (some of them even made to look like old CatEye cycle computers). Sleek new bikes from aspirational brands like Bianchi and Alfa Romeo (now making 17% of its annual revenues from bikes) occupy the smarter end of the shop while brightly-coloured bespoke bikes spill out of the workshops.

Pamela finds it hard to leave the shop, even though she wouldn't describe herself as an enthusiast. It is getting late and she needs to get back. Although she is some way from her hotel she isn't concerned as she has access via her phone to a dynamic map. The service the map offers is thorough – it even monitors her progress through buildings so that there is no chance of her becoming lost. The map shows her proximity to transport hubs and the availability and average speed of services. For a moment she is torn – she could take the fast bus (due at the nearest stop in six minutes) or she could rent a bike from the transit authority's docking station next to the shop. Previously a bike was a choice only for the brave of heart. However, restrictions on the use of cars means that the streets are not the intimidating free-for-all that they used to be. Enthused by her experience in the bike shop, Pamela elects to cycle. She switches to a payment app. She uses this app for a lot more than just payments. Her payment provider knows her buying history, her preferences and her favourites; it helps her make smart decisions and to get the best deals. The app knows where she is and alerts her to the fact that there's an incentive for using the shared-use bikes; if she hires a bike today she'll get 500 reward points. She's saving these points towards another long-haul trip that she wants to do next year. This is enough to persuade her to cycle back to the hotel rather than taking the bus. She'll see more of the city and she is already anticipating the selfie that she'll post on Eirebook, her favourite networking site.



Mario

Mario's report is late. Not a good situation to be in. And it's only Tuesday. Normally Mario is a man to enjoy the sensation of guiding a powerful and responsive electric car through the streets. However, he recognises that this is not the best use of his time. He hesitates a moment and then gestures to the car, indicating that he wants it to take over the driving. Gesture control debuted as long ago as the Consumer Electronics Show in 2015 has now been refined to learn each driver's unique gestures. The driving joystick glides back into the dashboard. Mario picks up his tablet and considers how he should structure the rest of his report. His musing is interrupted as his seatbelt tenses before the car brakes suddenly, avoiding an elderly pedestrian who has stepped into the road. Driving in this town used to make anyone feel old even after the shortest journey. Now though things are different. Most people elect to travel around by bus – it's faster than a car journey and cheaper. A lot cheaper. Mario is a successful man but the cost of driving from one business district to another in this town is very expensive – even in a zero emission vehicle. Mario has to concede that the roads are quieter and that his journey times have decreased. The jams that used to bring the city to a gridlocked halt are much less frequent now.

His car alerts him to a potential passenger just three minutes away. Sharing cars by giving people a lift has become common; each lift provides Mario with credits which can be redeemed against the (predictably expensive) cost of parking his car at his destination. The payments functionality of the car seamlessly integrates with that of his phone. Mario's parking credits are added to *Urban App*, which manages transit payments and credits in one place. This enables Mario to maximise the effectiveness of his spending; sometimes he pays for services through his credit card provider and sometimes he uses the parking and other credits provided by the transit authority. His app means that he doesn't have to carry cash for any transit payment and that he always pays the correct fare. He frequently accepts the incentives that are provided by the transit authority to use one form of transport over another depending on congestion and time of day – not only is it cheaper, it also saves him time.

As they head towards the town's third business district the car changes direction away from the main route. Sensors in the town's gas supply pipeline have detected a potential problem and an inspection crew is en route. This means that there will be congestion for those heading into town. The car has calculated that Mario will make faster progress by transferring to the metro. The car sweeps into the station entrance in the self-drive lane. The lane takes the car to the main door of the station, minimising transfer time. Mario and his passenger get out, leaving the car to return to the rental pool.

While Mario's report is late he'll be on time for his meeting; the car altered its speed as it approached the station to synchronise with the arrival of the train.



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