

What we are expecting from this presentation:

A

We want to inform you on the most important highlights from this topic

**B**

We need you to take the time to explore the presentation carefully and with a critical mind

**C**

We would like you to write down every comment or idea that emerges while reading this presentation

**D**

We exhort you to share with us a constructive feedback for further improvements

**E**

We invite you to dialog with us if you have any doubt or want to dive into some specific aspects



Smart Cities



- Intro to Smart Cities
- Components of Smart Cities
- Smart Cities applications
- Smart Mobility: Trends & Benefits
- Smart Mobility can be divided in 4 trends
- Smart Infrastructure business opportunities
- Smart Mobility Infrastructure is already present
- Smart Mobility challenges that need to be solved
- Takeaways and main conclusions

Smart Cities use innovative technology to improve the quality of life of their citizens

- A **Smart City** is one that uses technology to provide a **better quality of life to its citizen** and **grow economic development**
- Smart Cities implement **intelligent solutions**, such as **automating infrastructure** (traffic, energy, water supply, etc.), apply **data analytics** and use **connectivity** for a better communication
- Diverse and interconnected parts make up Smart Cities
- Governments, companies and citizens are all stakeholders in Smart Cities



Smart Cities bring benefits to citizens and give cities and economic boost

Why are Smart Cities created?

- The world's population is growing constantly. From today's **7.3B**, the number of world inhabitants is expected to grow to **9.3B** by **2050**
- Currently, about half of the population lives in cities and that number is expected to be **70%** by **2050**
- Cities contribute to more than **80%** of the **global GDP**
- **75%** of the total **energy consumption** happens in cities

Benefits of Smart Cities

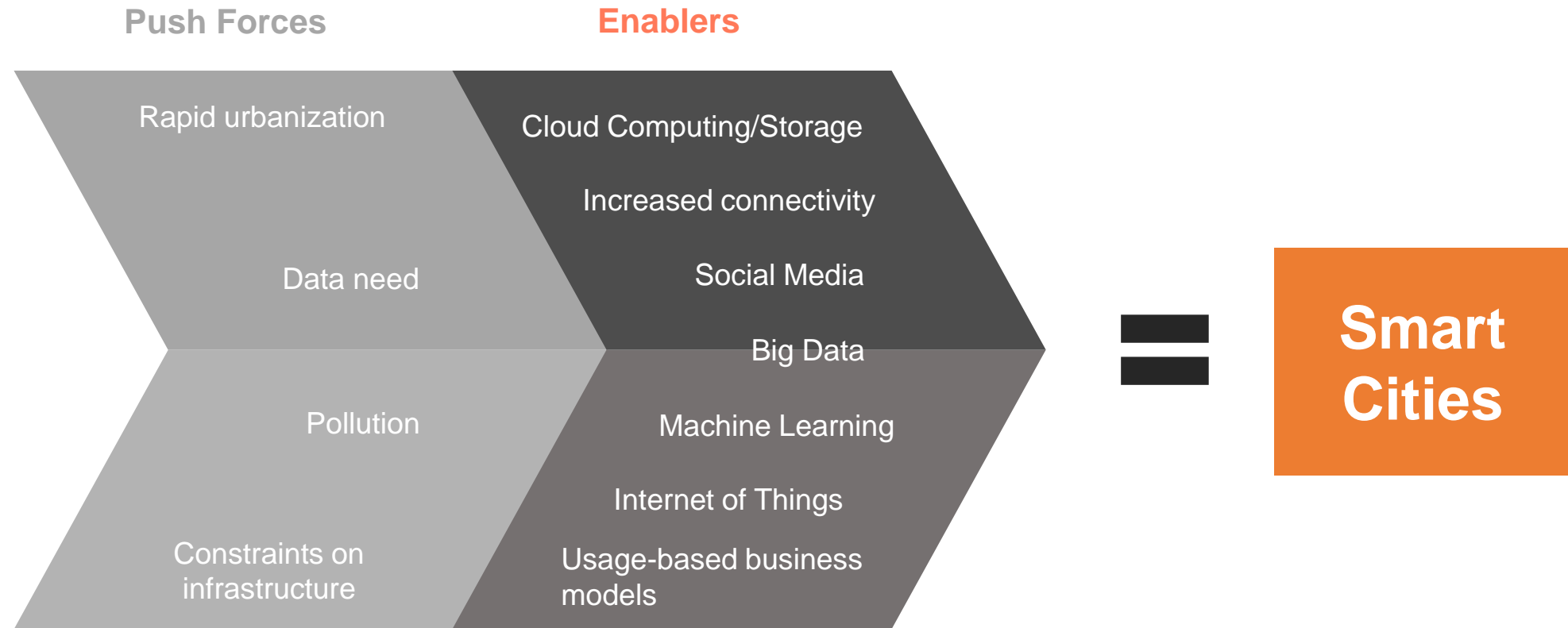
- Better quality of life
- Economic development
- Improved productivity
- Data analytics



- Energy efficiency
- Better city planning and development
- Better, cheaper and more efficient transportation
- More informed communities



Certain situations have pushed cities to become smart, and some technologies have helped it get there



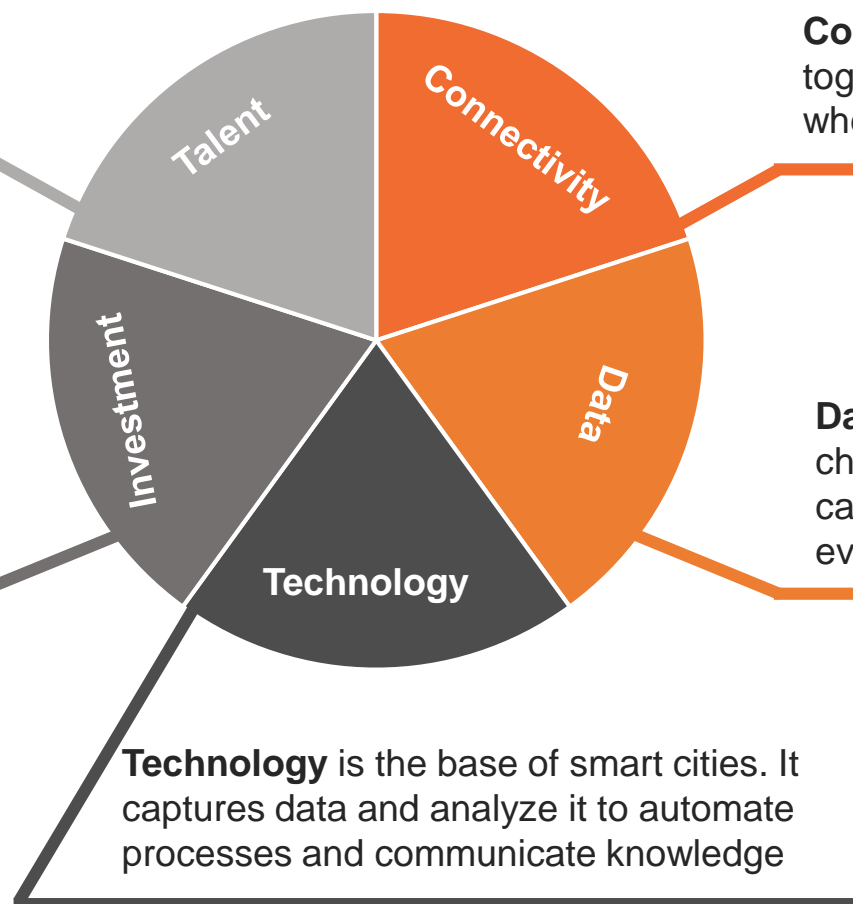
New technological advances have made Smart Cities possible, solving many of the problems within cities. All of these enablers interact with each other and give a solution that is bigger than the sum of its parts

When the information technology comes together with citizens, a Smart City is created

Components of a Smart City

Talented people are needed in order to build and run a smart city. Cities need experts that know how technology and people work, separately and together

Transforming a city into a smart city is not easy or cheap. **Investments** are needed to overhaul current infrastructure with technology. These can come from the government and private companies



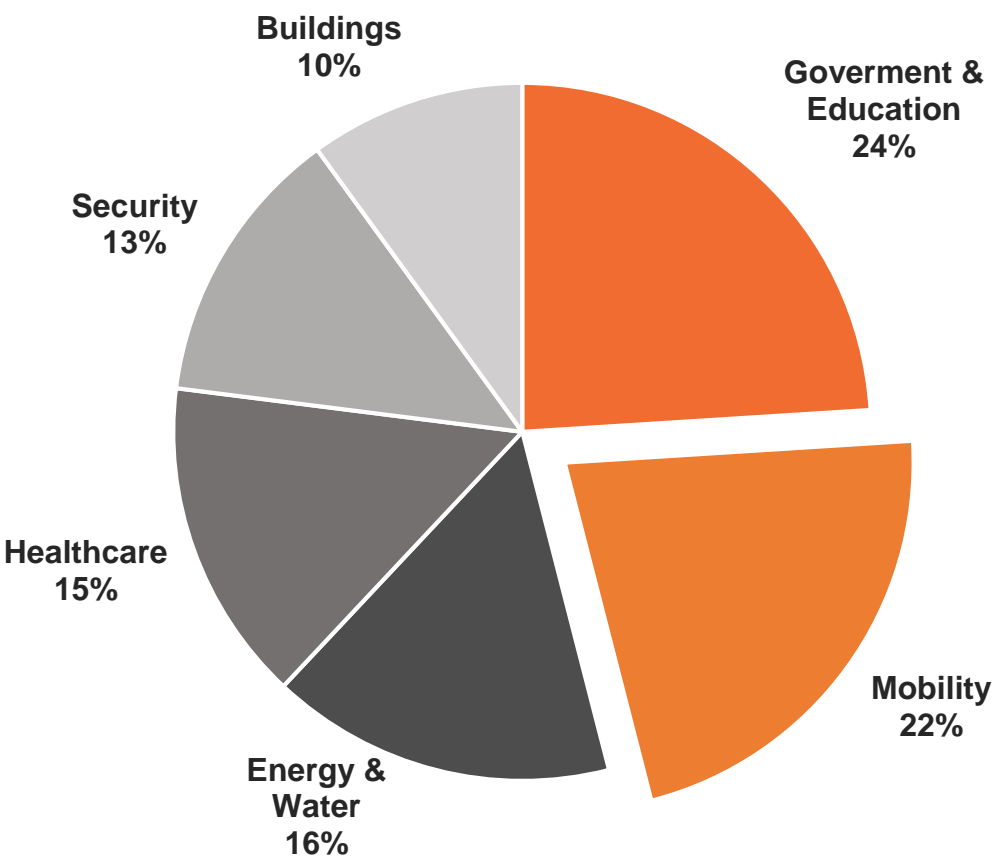
The Smart City industry is expected to grow exponentially in the next 4 years, from \$622B to \$1.5T USD

Market data

- Several cities have started implementing smart solutions, but no true smart city exists right now, **26 are expected by 2025**
- Most smart cities will be in North America, Europe and certain Asian regions
- Smart cities are currently a **USD \$622B** industry and are predicted to surpass **USD \$1.5 T** by 2020
- The smart city market is expected to grow at a rate of **26% CAGR** (2016 – 2020)



Smart City market share per sector (2020F)



There are 7 different sectors that will play a key role on Smart Cities

Smart Government

- Public services will be transferred to the web, making them efficient and independent of time and location
- Data analytics tools make policy making more effective



Smart Buildings

- New constructions are energy efficient and equipped with sensors
- Buildings will automatically control and manage lighting, temperature, and other systems based on use and occupancy



Smart Security

- Video surveillance, drones, face-recognition and license plate tracking permit identifying, stopping, and preventing crimes
- Predicting crime tendencies using Big Data and Machine Learning



Smart Energy / Water

- Smart energy grids get power from renewable resources, manage loads using data analytics, and have dynamic pricing due to smart meters
- Water infrastructure detects leaks and uses predictive maintenance



Smart Healthcare

- Use of wearables and other technologies to monitor, diagnose and prevent diseases
- Advances in DNA sequencing, Big Data and Artificial intelligence will give a more personalized and accurate diagnosis and treatment



Smart Education

- Online courses help people learn new things and even get degrees independent of time and location and with low cost
- Education can be tailored to a specific person, making it more effective



Smart Mobility

- Sensors, interconnectivity and data analytics help reduce traffic, travel time, pollution and costs while safety increases
- Different travel options give flexibility to everyone and accessibility to people that couldn't easily travel alone, like the elderly and children



Mobility, as it exist right now, has many problems that need to be addressed

Congestion

On average, people in the US lose a whole work week due to congestion



Pollution

Around a third of the air pollution in the US comes from vehicles. This causes thousands of deaths every year



Inefficient

Streets and bus routes are not optimized to move the most amount of people in the least amount of time



Inflexible

Current infrastructure needs a great amount of time and money to change and adapt to new situations



Expensive

Transportation is the 2nd biggest expenditure for American households



Unsafe

1.3 M people die from car accidents every year, and most of them are preventable



Smart Mobility tries to solve the problems with transportation using technology



























Definition of Smart Mobility:

“Mobility enable us to go to work, to school, to our home, and explore our surroundings. Mobility is considered smart when it enables seamless, efficient, flexible and safe travel through various modes using innovative technologies”

Benefits of Smart Mobility:



Smart Mobility can be divided into four main trends that try to solve current mobility problems, we will focus on Smart Infrastructure

Smart Infrastructure	Electric Vehicles (EV)	Shared Mobility	Autonomous Vehicles
<ul style="list-style-type: none"> The result of combining physical with digital infrastructure Provides improved information to enable better decision making, faster, and cheaper Collects and analyzes real-time data to observe, manage and optimize traffic Parking becomes efficient, streetlights and traffics signs get new functionalities <div> <div>   </div> <div>   </div> <div>   </div> </div>	<ul style="list-style-type: none"> Uses one or more electric motors for propulsion Air and noise pollution and the falling price of lithium-ion batteries boosts the development of electric vehicles EV's are environmentally friendly, no pollution and higher efficiency Low range and high prices remain inconvenient <div> <div>   </div> <div>   </div> <div>   </div> <div>  </div> </div>	<ul style="list-style-type: none"> Social trend towards sharing vehicles such as cars and bicycles, rather than owning them Vehicles used when needed Temporal renting of vehicles (car2go, bike sharing) or ride sharing (Uber, Lyft) Shared mobility means less vehicles per individual and reduction of congestion and pollution <div> <div>   </div> <div>   </div> <div>   </div> <div>  </div> </div>	<ul style="list-style-type: none"> Drive independently and react automatically to road signs, other vehicles, pedestrians, and traffic risks Risk of accidents caused by human failure reduced to zero High impact on future interior design since steering wheel and pedals become superfluous By 2030, 30% of cars will be autonomous <div> <div>   </div> <div>   </div> <div>   </div> </div>

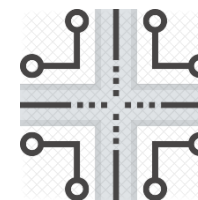
Note: Focus on Smart Infrastructure, we already developed deep dives into EVs and AVs. Shared Mobility will be analyzed in the future

Source: McKinsey & Company (2016). An intergraded perspective on the future of mobility

Smart Infrastructure uses technology to reduce congestion and overcrowding in city traffic

What is Smart Infrastructure?

- A city's road infrastructure (traffic lights, streets, road signs etc.) becomes smart when sensing technologies are embedded and used to observe, analyze and deliver real-time data of traffic situations in order to optimize traffic
- Smart infrastructure also includes intelligent public transportation, smart parking, smart streetlights, and smart roads
- Vehicle to Infrastructure (V2I) communication is also made possible due to smart infrastructure that connects with cars and exchanges information about traffic conditions



How does Smart Infrastructure work?

- Real-time traffic data is collected by cameras, sensors, cellphones, social media and connected cars
- Intelligent systems use the generated data to automatically optimize traffic by adapting road signs, traffic lights, speed limits or redirecting cars
- V2I communication coordinates vehicle density with city infrastructure to reduce traffic congestions



How is Smart Infrastructure connected?

- There is an ongoing debate about the technology to be used for communication, whether direct short range communication (DSRC) or cellular
- The answer will most probably be a combination of both:
 - DSRC for V2V (Vehicle to Vehicle), due to the low latency and direct communication
 - Cellular for V2I, for the flexibility and already existing infrastructure



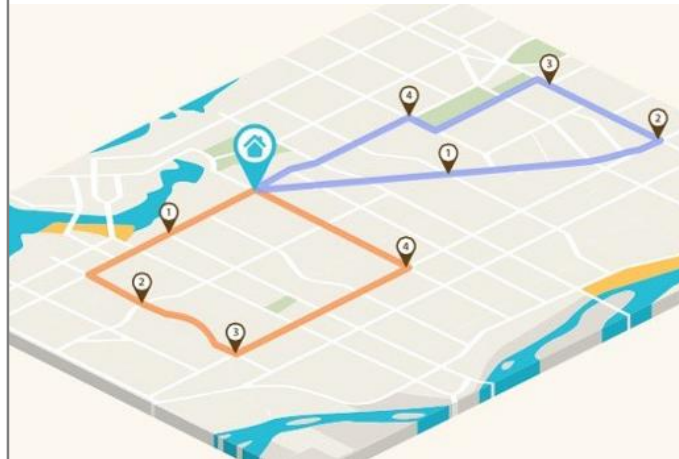
Being a part of Smart Infrastructure, intelligent public transportation will also bring benefits to society by improving user experience and cutting commute time

Real-time Public Transit Information



An app that informs users about the real-time location and arrivals of buses and subways

Adaptable Routes



Efficient routes that adapt to meet user demand and current traffic situations

Easy Universal Payments



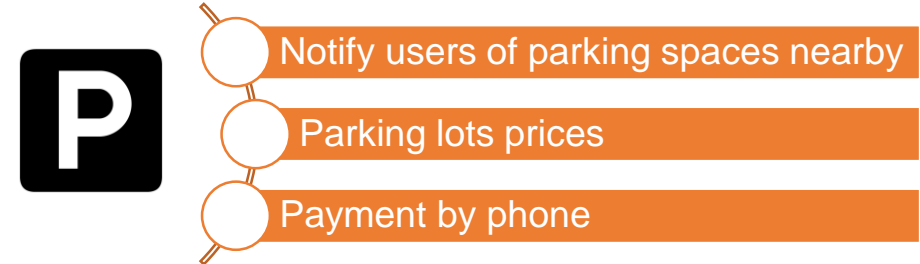
Transportation payments using a smartphone or a single card that works everywhere

While some of the Smart Infrastructure opportunities work directly with governments, Smart Parking caters directly with companies and consumers

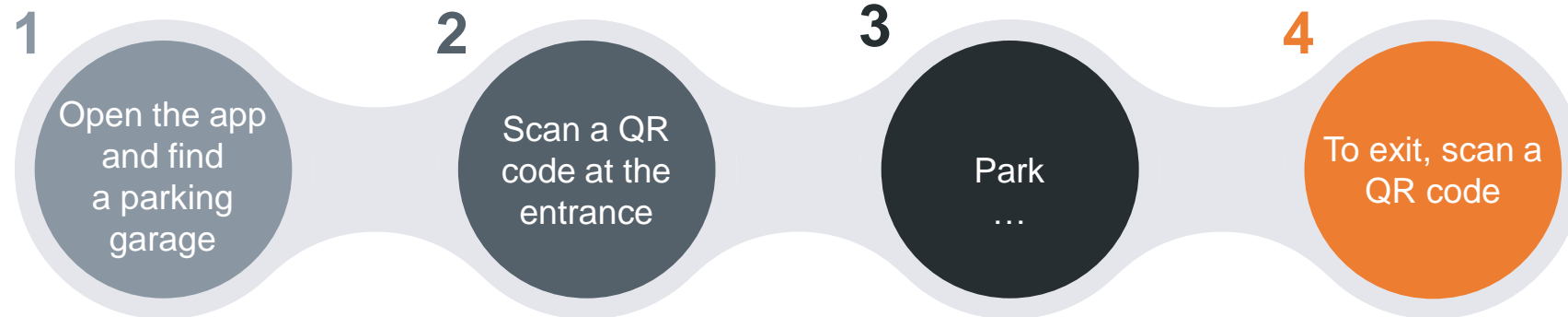
Smart Parking

- Every time a person drives their car, they have to find parking. It is an everyday task that can get smarter
- People waste a lot of time looking for parking and further clog up traffic even more
- Smart Parking brings a simple solution to find and pay for parking

Opportunity for a Smart Parking App



How does Smart Parking Work?



Note: In the future, the scanning will be replaced by an automatic V2I communication

Smart Mobility Infrastructure is already present in some cities worldwide

Dublin



- City management built citywide sensor network to collect **traffic information** and **geospatial data** together with **IBM**
- Enabling the **monitoring and management of traffic in real-time**
- Data is transmitted every 20 seconds to create **digital map** and manage traffic

London



- Local government body Transport for London (TFL) built *London Underground TrackerNet system*
- The system feeds **BBC** and other partners with **real-time information about train movement**

Atlanta



- Metropolitan Atlanta Rapid Transit Authority (MARTA) is using travelers **real-time data** to make travel safer
- **MARTA See & Say** app allows travelers to **report suspicious actions** or get **police alerts** directly to their smartphone

Singapore



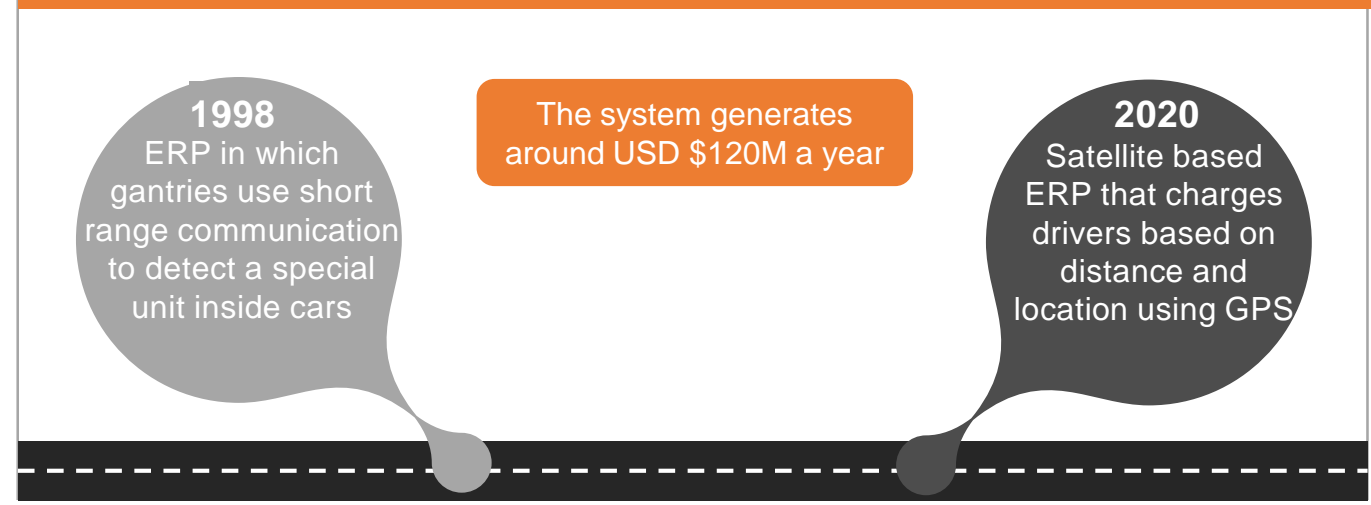
- The city-state of Singapore has implemented several smart infrastructure projects focused on improving congestion
- The city was the first to introduce an **electronic congestion charge**, automatically billing drivers for entering congested areas
- Singapore has a centralized system that optimizes traffic lights to reduce congestion and create green-light waves

While several cities have shown Smart Infrastructure projects, Singapore has been a leader in the field

Singapore's Smart Mobility projects

- Centralized unit that manages all Intelligent Transportation Systems (ITS), for example traffic signal control, traffic monitoring, incident management, etc.
- A parking guidance system that routes drivers to the nearest available parking lot
- Pedestrian green lights times are extended for elderly and pedestrians with disabilities
- The Expressway Monitoring & Advisory System (EMAS) monitors traffic along roads, alerts motorists of traffic incidents and ensures swift response to these incidents
- Singapore was the first city to implement road pricing, billing drivers for entering congested zones

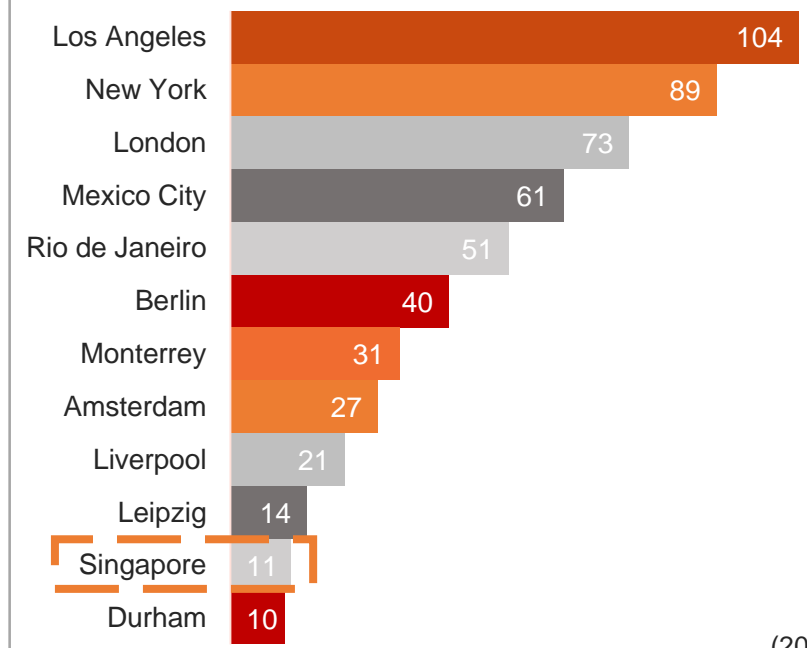
Evolution of Electronic Road Pricing (ERP)



Benefits of Smart Infrastructure projects

- In a study analyzing the cost of public transport by GDP per capita, Singapore was ranked as the best high-density city and the 3rd overall
- While the amount of cars in the roads grew 40% from 2005 to 2014, the volume of traffic only grew 23%

Hours lost annually to congestion per person



(2015)

Several companies have established themselves in the Smart Infrastructure sector, and several others are quickly getting a seat at the table

SIEMENS

- Among many products and services, provides smart infrastructure solutions to improve mobility
- For example, the Sitraffic Motion MX is a software for the optimization of an entire traffic lights network
- Revenues of USD \$9.1B in Mobility sector (2016)



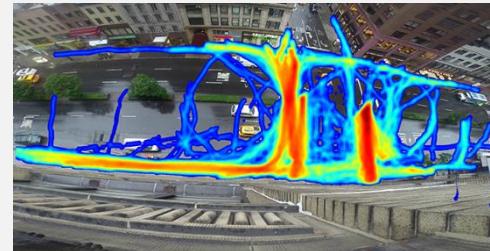
ERICSSON

- Focused on IT solutions including the transportation sector
- Ericsson's Connected Urban Transport platform gives authorities and cities the ability to collect and analyze real-time data from connected vehicles, infrastructure and devices
- Made a single payment method for the different public transport vehicles in the Netherlands



BriskSynergies

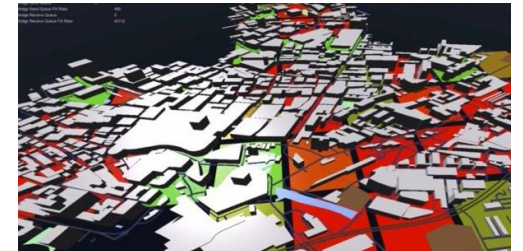
- Uses computer vision to analyze movement
- The system can make a road safety diagnosis to detect high risk intersections using predicting collision trends
- Helps city planners make better decisions to reduce traffic flow and prevent collisions
- Some of its clients are the cities of Toronto, Montreal, New York, and Mexico City



Immense

Enabling Intelligent Mobility

- Provides simulations of traffic and cars in cities
- Help cities and companies understand patterns and problems in the transportation system
- Recently did a full simulation of the city of Manchester and received a USD \$29M grant from the U.K government



Smart Mobility is becoming more present on our daily life and with it, brings on new challenges, which we need to have in mind

Financial Pressure



- Keeping up with population growth and urban movement means financial challenge to cities
- About USD \$90T globally needed by 2030 to achieve population growth and urban moving expectations, particularly in developing countries
- In the beginning, new mobility technologies will be expensive and only limited users will get access to them

Legislation



- To keep up with the high upcoming costs of smart cities and smart mobility, new financing models are necessary
- Grants and fundings may be established by local governments
- This requires a strong public-private cooperation
- Public data must be handled carefully to maintain cybersecurity and meet policy restrictions

Skill Gap



- New and specific know-how needed to create *smart city*
- Know-how might not be available worldwide
- Challenge of merging city planning and human behavioral science
- Special knowledge and trainings might be needed for planners, engineers and operators

Smart Cities and Smart Mobility are changing the way people live and travel

Takeaways

- As time progresses, more and more cities will look for smart solutions
- Smart Cities will transform the way people live by bringing connectivity, productivity and efficiency
- Mega cities will become, in the short & medium term, Smart Cities
- Smart Mobility will change the way people move around a city
- Smart Infrastructure saves time, increases safety, lowers pollution and makes travelling more affordable for citizens



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