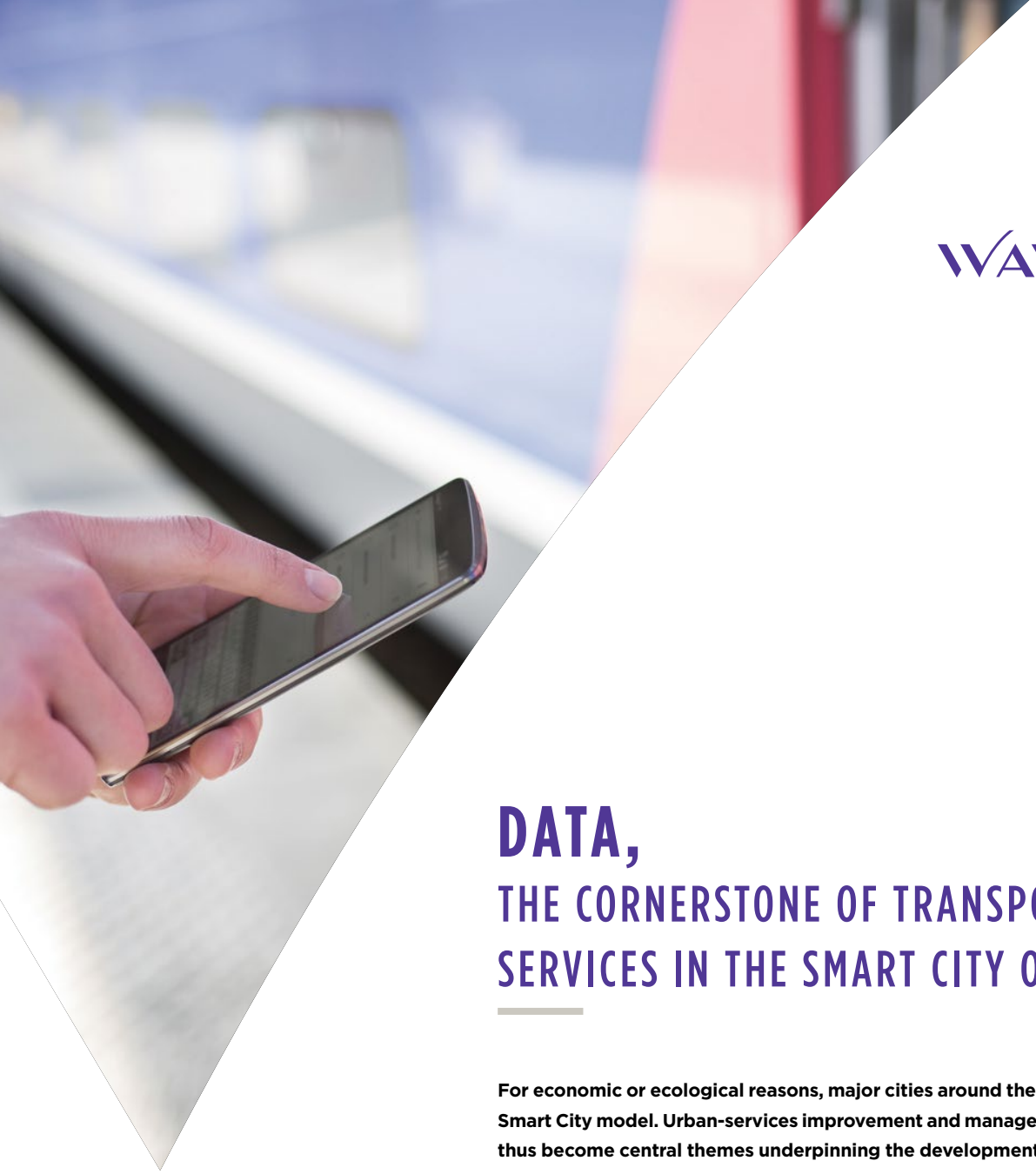

WAVESTONE

DATA,
THE CORNERSTONE OF TRANSPORTATION SERVICES IN THE SMART CITY OF THE FUTURE

For economic or ecological reasons, major cities around the world are looking to adopt a Smart City model. Urban-services improvement and management-cost optimization have thus become central themes underpinning the development of our future cities.

Digitalization is playing a key role in optimizing the functioning of all urban services without exception (energy, waste management, water distribution and transport service optimization etc.). Economies of scale and significantly enhanced reliability can be achieved via a better analysis of demand and more dynamic resource management.

As a result, this is causing quite an upheaval in the transportation sector where the advent of digitalization has prompted an in-depth transformation in transport solutions and usages. Because transportation is an everyday issue for commuters it has become the major focus of development for Smart Cities. Here, data can play a significant role since major improvements can be achieved via the de-compartmentalization of resources.

THE INCREASINGLY IMPORTANT ROLE OF DATA IN TRAVELER AND TRANSPORT-PROVIDER PLANNING

Thanks to digital progress made in the transportation sector, consumers can, in just a few clicks, access an unprecedented range of urban transport solutions with a greater variety of modes of transport (collaborative offers, bicycle parks and self-service cars, etc.). Transport data are largely shared in Open Data format and, as such, provide the source of new comparative services. Route planner applications such as *CityMapper* give travelers a real-time overview of all available transportation options for getting from A to B. Data of transport providers are cross-referenced to provide the fastest, cheapest and most accessible multi-modal transport solutions. While these solutions are both practical and generally reliable, they are still highly dependent on the quality of the information communicated by the various

AUTEURS


GUILLAUME DURAND
guillaume.durand@wavestone.com

MARION COUTURIER
marion.couturier@wavestone.com

With the collaboration of Antoine Laporte et Chloé Laganier.

transport providers to ensure that users have the most precise and up-to-date information they need to meet their real-time needs. This is particularly relevant when traffic flows are disrupted.

At the local authority level, availability of transport data also enables Transport Organisation Authorities (TOA) to better plan the development of their transport networks by adapting transportation solutions to match commuter flows. Paperless ticket solutions play a key role in analyzing traveler flows by providing a comprehensive overview of the itineraries followed and even the connections made. Major cities across the world have adopted systems similar to that initiated by the city of London which, with the "*Oyster Card*" travel pass introduced in 2005, uses passenger travel data to optimize transport planning.

Finding new data sources is still the major challenge. Sources such as user geolocation apps, research into the most common itineraries for each mode of transport, and flow monitoring enable transport providers to get a clearer picture of civilian travelling habits and fine-tune their offerings. Certain Transport Organisation Authorities draw on a variety of data sources to prepare their transport plans and develop their networks. Some approaches employed in several cities around the world are outlined below:

REAL-TIME SHARING OF INFORMATION TO IMPROVE REACTIVITY OF TRANSPORT SERVICES AND ENHANCE TRAVELER MOBILITY

New transport start-ups have initiated a trend whereby more and more travelers are being solicited to supply real-time information on the functioning of transport networks. Applications such as *Waze* and *Moovit* offer direct access to geolocation data and can therefore provide more rapid solutions when transport is disturbed.

The Waze Connected Citizens Program draws on real-time information collected from users to help cities optimize traffic and infrastructure monitoring and to enable communities to rapidly diffuse information likely to impact travelers' itineraries: modifications in transport plans, roads temporarily blocked by garbage trucks, etc.

USER CONNECTIVITY, A MAJOR ASSET KEY TO THE DEVELOPMENT OF NEW OFFERS

User connectivity and reactivity also serve as the bases for new concepts such as microtransit, which is designed to offer transportation services tailored to meet user requirements. The idea is to instantly match supply and demand by grouping several users traveling from, and to, the same departure and arrival zones and then create a temporary line adapted to the places of origin and destination of each member in the group. This has seen the emergence of numerous new commuting solutions such as the *Padam* startup in the Paris area, and *Chariot* in San Francisco. Based on the *Test & Learn* approach, these solutions are designed to meet user demand by providing commuters with a limited list of departure/arrival times and geographical locations. The success of *UberPool* (a solution already used by millions of commuters) bodes well for the future of shared-use mobility on demand solutions if the concept is reproduced on a much larger scale, notably with target-model trends pointing towards the self-driving minibus.

Data exploitation has therefore enabled a shift from a model which is difficult for users to express what they want in terms of transport solutions to one that offers the real-time adaptation of transportation plans based on demand and the availability of resources. Pricing can also be dynamic by increasing tariffs of public transport during rush hour periods and lowering them during pollution peaks for example. In the same way, parking space tariffs can fluctuate locally to balance out occupancy rates of each zone and therefore make it easier for drivers to find spaces.

70%

of accidents are listed on Waze even before the emergency services are notified, according to an American study

Location

SINGAPOUR
Using user telephones to locate travelers

The operator SingTel recuperates and exploits anonymous geolocalisation data of users to better model communter flows in any given city, particularly at peak-hour periods. These data, for example, serve to analyse the impact of changes in transport plans and tariffs.

Itineraries

BOSTON
Using Uber data to develop networks

The city of Boston analyses chauffeured-driven car journeys to identify the key zones where, and the times when, the need for public transport is greatest. Uber-trip cartographies serve to optimize the development of transport networks.

IoT

GLASGOW
Using sensors to study transport flows

In Scotland, the Open-data pionneering city of Glasgow has installed a network of strategically places censors at key points to measure pedestrian and cyclist flows. This makes it possible to study the relative importance of these soft modes of transport ans quantify actions carried out in their favor.

CENTRALIZED MANAGEMENT SYSTEMS FOR MORE REACTIVE TRANSPORTATION OFFERS

To optimize the real-time management of these different flows, cities must now use a unified management platform for their transport systems. This is dematerialization at its best: offering the possibility of purchasing tickets for any mode of transport directly from the application and price scalability depending on the criteria employed. In 2014, the pioneering city of Helsinki announced the launch of a "*Mobility As A Service*" (MaaS) platform which will eventually serve as the single platform for all of its transport services. Aware of the imminent arrival of these urban mobility management software programs, numerous players are now creating solutions designed to seduce the cities of the future. Some notable solutions are *Flow* (Google) (see boxed text opposite) and *Moovel* (Daimler).

LEVERAGE DATA ANALYSIS TO BETTER DEFINE AND READAPT TRANSPORTATION OFFERS

Data analysis offers a multitude of prospects, not only for anticipating user needs but also for estimating the impact of changes in transport plans on traveler itineraries. Indeed, data collected can be used to create predictive models capable of accurately simulating civilian travel patterns which, in turn, can be used to model the impact of these changes and better manage the operations of transport providers. This simplifies urban planning and offers transport organizations the possibility of observing the real-time impact of any changes they may make in their transport plans.

Flow, a software program created by Sidewalk Labs (subsidiary of the digital giant, Alphabet) to completely re-think urban transport, transit and parking systems, uses anonymous data collected from user smart-phones and street censors to provide cities with a clearer picture of real-time transport conditions. This collaborative approach makes it possible to optimize transportation offerings by redirecting users to other modes of transport or less congested routes at peak periods. Analysis of these data gives a better view of possible problem zones and simulates the impact of creating new, innovative mobility themes and services.

By cross-referencing data related to topography, demographics and weather conditions, etc., it is possible to predict traveler behavior with a fair degree of accuracy in any given zone. Knowledge of these trends enables sector players to readjust their transport offerings by providing relevant network extensions or by optimizing the management of their available resources. The Bordeaux-based start-up, *Quicit* is an example. Drawing on the various sets of data specific to each town, and historical utilization rates of self-service bicycles, these algorithms can be used to predict station occupancy rates over the more or less long term. Another French startup, *ForCity*, provides such services to the city of Lyon and the operator Keolis designed a transportation plan to convey football supporters to the stadium and the fan zone during the 2016 Euro football championship. A behavior modeling platform has been set up to test different scenarios and optimize flows. Transport-offer administrators therefore have much to gain by drawing on their in-house and external expertise to validate the different sets of data they have access to in order to tailor their solutions to better meet the real needs of travelers.

WAVESTONE'S 5 KEY DRIVERS

18%

to reduce traffic flows in some districts of Boston thanks to the Waze Connected Citizens Program

UNDERPINNING A SWITCH TO THE SMART CITY TRANSPORT MODEL OF THE FUTURE

Numerous transport-providers have therefore taken the initiative and integrated data into their models. As such, to reach their objectives, players in the Smart City sector must enlarge the databases of the transportation systems they manage and change their mindset so that they can adopt the data-oriented transport systems of the future. To achieve this, we recommend implementing the 5 key drivers below.

MORE VARIED SOURCES OF DATA

Adopt an exclusively Open Data strategy

Giving access the one's data not only breaks down the silos of resources that are vital for planning, but also serves as a tool to co-construct with stratups specialized in data validation and boasting a real innovation capacity.

Exploit new IoT data

Although the numbre of connected objects used in urban transport systems is still limited, the development of these sensors and intelligent objects will enable the acquisition of a multitude of new data which can be validated for a variety of purposes (flow management, maintenance, etc.).

Focus on traveler data

Access to traveler data (by virtue of the massive quantities involved, as well as the reactivity and the fact that they are most often reliable) is set to become the preferred source of information for players in the transportation sector to better adapt their offer. Anonimity must be ensured to convince users to share their data.

ADOPT A NEW METHODOLOGY

Promote a Test & Learn approach

New concepts developed via data validation should be tested on a small scale in order to prove their viability.

An agile operating approach makes it possible to adapt rapidly to the reality of the situation on the ground.

Most towards a new ecosystem

To ensure optimal data validation, players in the transportation sector must team up with, and learn from their digital counterparts as well as stratups and major groups.

Founder of Quicit, Raphael Cherrier, explains how the validation of various types of data can enable cities to optimize their transportation networks.

What benefits do your predictive models offer users and transport-offer administrators?

RC: Analyzing historical data shared by administrators makes it possible to analyze the cyclicality of demand (concerning the occupancy status of self-service bicycle stations for our *BikePredict* app, or that of public car parks for *CityPark*). While the results thus obtained are quite precise, our algorithms permit a more in-depth analysis by integrating other types of data. For *CityPark*, we also use data obtained from drivers willing to temporarily share their location. As such, users will be able to better anticipate their mobility requirements if they know they can find a bicycle or a parking space rapidly and, if necessary, opt for another mode of transport. Transportation administrators can adapt their fleets thanks to these forecasts and a better understanding of mobility needs.

In your opinion, what role will data play in the Smart City of the future?

RC: Data will have an enormous role to play in the organization of our future cities. Start-ups such as ours can already use data to develop predictive models to assist transport providers in their planning, upstream. This enables us to create network operation simulation models and estimate the impact of opening a line for example.

The city of the future must incorporate dynamic data into these models to ensure a better organization and the enhanced reactivity of its transport systems. Users are also playing a more important role in transport organization and becoming increasingly more willing to give their opinions and share information on any problems encountered. Offers could thus be better adapted to user needs and user feedback will be taken into account more rapidly.

WAVESTONE

www.wavestone.com

Wavestone is a consulting firm, created from the merger of Solucom and Kurt Salmon's European Business (excluding retails and consumer goods outside of France). The firm is counted amongst the lead players in European independent consulting.

Wavestone's mission is to enlighten and guide their clients in their most critical decisions, drawing on functional, sectoral and technological expertise.