Mobility is a necessity; people need to move from one place to another to obtain or ensure their personal needs. However, mobility is also a luxury as it facilitates access to exploration, recreation, and leisure. In a city high quality mobility is a must in order to secure opportunities and grant success in other urban sectors. This paper investigates how to move from a reactive approach to mobility services to a proactive, sustainable model.

**Challenge of Urban Mobility**

The combined influence of population growth, demographic change and changing urban form leads to increasing demand for travel in city centers, suburbs and between the two. Demand for improved intercity mobility is also growing, to create faster and more direct connectivity between settlements. As demand rises, so too do concerns about transportation as one of the leading contributors to global greenhouse gas emissions, congestion, noise and poor air quality in cities.

Due to increased population and demographic changes, there is an increased demand for travel both in and between cities and suburbs. Unfortunately this growing demand is not met with the corresponding supply of physical transport it needs, resulting in overcrowding and congestion.

It is important to take “peak demand” into account. One of the biggest challenges of urban sustainability is to maintain economic vivacity and at the same time minimizing recourse use. Many growing cities respond to this by building physical infrastructure (roads, rails, bike paths etc.) However this is not enough. The key is to maximize utility of existing and planned infrastructure by distributing demand accordingly across modes, routes and time. An adequate response is a holistic one, looking at both supply and demand by:

1. Actively managing capacity over time to make the most efficient use of existing physical infrastructure (operational efficiency); and
2. Distributing reliable information to travellers about the relative costs and benefits of different travel options, thereby promoting behaviour change.

Thus helping to reduce the peak demand for travel on any single mode or route and distribute the overall demand over time and across modes.

**Smart Mobility**

Technologies and services that support smarter mobility benefit travellers, service providers, and urban planners. Many of these products use real-time data to present homogenous information. Little by little individuals and service providers are using smart technologies in a marketplace predominantly formed of small private actors. In some cases, city governments and urban planners have tried to
make the most of the economic potential of these technologies.

The emergence of new technologies and information-based services for mobility presents a plethora of invaluable solutions to the challenges of operational efficiency and personal travel demand in cities. Travellers are not the only ones who will benefit, in fact, transport operators, urban planners, and city governments together will be able to improve system functionality, environmental sustainability, traveler experience and new economic value.

Structure of Smart Mobility

This system calls for physical infrastructure, operational technologies, as well as communication and information technologies. Smart mobility product will not meet their full potential if one of the mentioned components is missing, and as a consequence will not be able to manage operational efficiency and user demand. Integration and coordination between the components is key.

Mobility and the Role of Data

Developing information services is only attainable by going through a sequence of actions, from the installation of intelligent infrastructure to data collection and processing. At each stage in the sequence value is created, in this way, the total value of an information service is greater than the sum of the integral individual pieces. This value can be defined in terms of economic and financial gains to stakeholders throughout the value chain, and also user experience and environmental benefits.

Value chains can exist disorderedly or clearly depending on information components and the raw data that is available. Sometimes it is more difficult for cities to predict which services can be delivered. Establishing where it is best to intercede requires expertise not only in dealing with new technology space, but also in managing relationships with citizens, app developers, and the private sector. Value chain analysis depicts how multiple data streams from multiple sources are required to build these smart mobility services.
**Data source**
- Public transport service providers
  - Location and time of use
  - Journey time
  - Routes
  - Passenger flow
  - Service status
  - Cost
  - Potential delays
- Private transport service providers
  - Location and time of use
  - Service status
  - Availability
  - Journey time
  - Cost
  - Number of vehicle
  - Routes
- Citizens
  - Real time location
    - Date / time
    - Movement
    - Communication pattern
    - Service accessed
- City areas and maps
  - Weather data
  - Environmental data
  - Usage patterns
  - Demographics
  - Routes
  - Geospatial information
- Police, borough, public and other stakeholder
  - Faults of traffic control equipment
  - Emergencies / Incidents

**Raw data**
- Location and time of use
- Journey time
- Routes
- Passenger flow
- Service status
- Cost
- Potential delays

**Information component**
- Live departures for public transport services
- Time delay of public transport services
- Passenger flows of public transport service by time, location, route, service
- Mapping vehicle flow by time and area
- Usage patterns of bike sharing service and car park by time and area
- Usage patterns of car sharing by time location and area
- Supply and demand on taxi, car sharing and ride sharing by time, location and route
- Mapping or virtualising traffic movement in cities
- Mapping traffic congestion patterns in cities
- Traffic control and route modelling
- Road traffic and emergency analytics
- Demographic of mobile internet usage
- Spatial usage of streets and neighbourhoods by time and date
- People movement patterns

**Information services**
- Real time transport information and journey planning service: eg.
  - Citymapper
  - DB Navigator
- Command and control centre: eg.
  - Barcelona
  - Dallas
  - London
  - Madrid
  - Rio de Janeiro
- Access to travel choices:
  - Taxi, e.g. Hailo, Uber etc.
  - Bike sharing e.g. Barclays cycle, Ubike etc
  - Car sharing, e.g. Zipcar, DB Navigator
  - Ride sharing, e.g. Zimride, Blablacar etc.
- Parking / charging point service with dynamic pricing:
  - SFpark
  - Park Right
By building on operational technology and data, new mobility services are beginning to address problems such as peak hour travel demand, while simultaneously presenting the promise of a better life in the city. However, offering these demands a variety of data streams from various data sources and technologies. In order for this to function properly it is necessary to establish an ecosystem wherein commercial, organizational, social and technical components exist.

Refernece

Volker Busches (Arup), LéanDoody (Arup), Molly Webb (The Climate Group) and Charbel Aoun (Schneider Electric) worked together to produce a white paper about Urban Mobility in the Smart City. Given its relevance, Victoria Noya has provided a summary of the key points and conclusions.