Agenda

1. Introduction
2. The definition of a ‘Smart City’
3. ITS for Smart Cities: Strategic planning and prioritisation
   - Challenges
   - Needs-based ranking of ITS applications
   - Pre-requisites and non-technology enablers
4. Application examples
5. Future Transport: from Intelligent Transport Systems to Integrated Transport Services
   - Mobility as a Service (MaaS): principles and aims
Services

Our scope

**Smart City**
- Technical assistance for NFC ticketing implementation to the STIF (Syndicate of Transport of Île-de-France)
- Real-time multimodal mobility solution conception for the City of Copenhagen
- Astana ITS technical assistance
- Interoperable Technical specifications implementation assistance to the IT department of RFF (French Rail Infrastructure Manager)

**Big Data**
- Mobility Analysis platform: to produce indicators from mobile telephone data
- Standard data analysis to produce mobility indicators
- IT Master Plan for the RFF (French railway infrastructure manager) for the capacity and Circulation systems

**Market and opportunities Studies**
- New technologies for public transport market studies

Our skills

- Functional analysis and Concept of Operations, traffic modelling / real time demand visualisation, macro-level emissions modelling, specification and delivery management of transit smart card services, advisory services on TDM / LEZ / managed motorways, policy advisory / PPP transaction advisory, performance management regime development, procurement strategy development, stakeholder consultation

Our tools

- Traffic and pedestrian modelling: CUBE, Vissim, 3Ds
- GIS: MAPINFO, ARGIS, QGIS, GLOBAL MAPPER
- Programming: Python, PHP, JavaScript
- Frameworks: Backbone, node, API, spark, Hadoop
- Data base Manager: SQL Server
- Resource management: GESCAR (PERINFO)
2. Definition: what do we mean by a Smart City?
Smart Cities: Points of view

- Top down, government led, techno-centric or bottom-up, citizen led?
- Technologies such as the Internet of Things (IOT) and municipal data portals funded by tax payers are the enablers and pervasive sensing can be presented as good or bad
- Competing visions of the future: smart city reflect competing visions of government, society and the role of the citizen
- How much technology is really needed for communities to interact, particularly in rural communities?
- What is the role of the user in designing his/her space in the smart city?
- Integration of urban planners, architects, community group, engineers will contribute to the phased implementation of smart city innovations
- Transport plays a vital role in connecting urban spaces
“[The use of] technology to enhance pedestrian and vehicular accessibility and manage the district facilities, and disseminate information to the public in digital format, with a view to making the area a better place for work and play”

CY Leung, Chief Executive, Hong Kong SAR, March 2015
“A Smart Nation means people and businesses are empowered through increased access to data, more participatory through the contribution of innovative ideas and solutions, and a more anticipatory government that utilises technology to better serve citizens’ needs.”

Infocomm Development Authority of Singapore
SMART LONDON PLAN

“Adopting new approaches, through bringing people, technology and data together, will enable more integrated solutions to addressing London’s challenges... [an approach] that puts Londoners at the heart - driven by the principles of openness, collaboration, innovation and engagement.”

Greater London Authority, Smart London Plan, 2015
3. Transport:
Strategic planning and prioritisation
Transportation: challenges

- Ensuring availability of transport capacity when and where needed
- Traditional focus of planning for peak demand > demand spreading / reallocation amongst modes
- Planning for resilience against natural (e.g. meteorological disruption) and man-made threats (e.g. terrorism, cyber warfare)
- Asset use optimisation: from initial planning (capex) to day-to-day operations
- Improving accessibility for all users
- Improved information management within jurisdictional areas and across jurisdictional boundaries
- Traditional focus on system performance > focus on outcomes

Overall: transport infrastructure and the systems that make it work need “to add value to the areas in which they serve”*.  

[*Ref. IET Intelligent City Transport Hubs: Characteristics for Success]*
ITS-based services: productivity and liveability-based assessment

<table>
<thead>
<tr>
<th>Applications</th>
<th>Improved productivity</th>
<th>Reduction in cost</th>
<th>Enhancement to livability</th>
<th>Scaleability (integration) Risk</th>
<th>Deployment (integration) Risk</th>
<th>Aggregate Added Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application 1</td>
<td>+++++</td>
<td>+++</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Application 2</td>
<td>+</td>
<td>+</td>
<td>+++</td>
<td>+++++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Application 3</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>

- Potential applications are then weighted based on local importance => ranking
- Technique allows sorting through many potentially conflicting applications and inter-dependencies
- Could extend to include safety, reduced harmful emissions / contribution to climate change and scoring of user satisfaction, etc.
ITS-based services: the Smart City ‘Hierarchy of Needs’

Service Integration Maturity:
Increasing levels of service integration, consumption efficiency and inclusivity

- Communication, sense of position and proximity to available services, able to opt-in and opt-out as needed, nobody excluded
- Connectivity, sense of position with respect to available services, feeling of inclusivity, system responsive to stated needs, security envelope
- Feeling of being informed, access to accurate information and services, social networks to inform within communities
- Participation, ability to influence, productivity improvement, cost & time saving, homogeneous Quality of Service
ITS-based services: the Smart City ‘Hierarchy of Needs’

- Multi-modal interoperable services
  - Open payment systems (e.g. cEMV)
  - Mobility as a Service (MaaS)
  - Institutional collaboration mechanisms
    - Traffic and Incident Management (TIM) System
  - Transport resource sharing
  - Data sharing (open data platforms) for co-creation
  - Demand-responsive public transport
    - ‘compact’ bus terminals - managed like airports
- Multi-channel traveller Information
  - Hong Kong eTransport Kiosks
- High availability, pervasive communications
  - High speed wireless networks
  - Heterogeneous networks
ITS-based services: the Smart City ‘Hierarchy of Needs’

Service Integration maturity

A: Institutional integration, pervasive access to user-centric services, livability, knowledge-oriented

B: Increasing breadth of linked services and homogeneous quality of service, operations-focused, information-oriented

C: Local or route-specific projects, quality varies between location or mode, comprehensive transport infrastructure, information-oriented

D: fragmented ‘enablers’, data-oriented
A more desirable future

- Improved planning, selective new transport infrastructure and making better use of existing capacity:
  - Can demand be spread or reallocated in the long term?
  - Multi-modal planning within economic corridors
- Reduce the journey time & journey time variability, ensure informed travellers particularly at modal interchanges

We need to move our thinking from pervasive, comprehensive provision of transport infrastructure and Intelligent Transport Systems to ‘joined up’ thinking and intermodal investments in selected application areas to deliver Integrated Transport Services.
Enablers

- A Smart City Master Plan, embracing transportation and urban planning
- A robust business case – to permit ‘best value’ prioritised investment
- Available finance from public or (increasingly) private sector sources
- Agreed principles of governance, collaboration and data sharing across institutional boundaries
- Service integration standards to enable connectivity amongst individual services
- Minimum requirement specifications to enable data exchange
- Service level agreements with 3rd party transport service providers
- Stakeholder consultation and market testing: initial and ongoing, to stimulate private sector participation
4. Application examples
Application example: Copenhagen

Objective: to ensure long-term economic growth on Copenhagen without a long-term decline in quality of transport services, road network performance, air quality and mobility by:

- Improving traffic flow and related accident rates
- Ensure broad awareness of travel options and air quality
- Reduce public transport journey time and journey time variability
- Reallocate a greater proportion of urban spaces to pedestrians (+20%) and cyclists (+50%)
- Ensure maximum travel time of 15 minutes to green spaces for 90% of residents

and additional qualitative and quantitative objectives to ensure carbon neutrality by 2025
## Application example: Partners (Copenhagen)

<table>
<thead>
<tr>
<th>BLIP Systems</th>
<th>Ixxi</th>
<th>Citelum Danmark</th>
<th>Imtech Traffic &amp; Infra</th>
<th>OpenAir Neighborhood</th>
<th>COWI</th>
<th>ITS Teknik</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hermes Traffic Intelligence</td>
<td>Technolution</td>
<td></td>
<td></td>
<td></td>
<td>Jesper J. Thomsen</td>
<td>Bicycle Innovation Lab</td>
</tr>
<tr>
<td>SYSTRA</td>
<td>Leapcraft</td>
<td>Siemens</td>
<td>IBM Danmark</td>
<td>Rovsing Management</td>
<td>Inno power</td>
<td></td>
</tr>
<tr>
<td>Parkéon</td>
<td>Inno power</td>
<td>Infrateam</td>
<td>AAU</td>
<td>DTU Fototeknik</td>
<td>DTU Space</td>
<td></td>
</tr>
<tr>
<td>Thetis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*24 selected participants*
Copenhagen – example deliverable: Mitigation of harmful emissions by bus route reconfiguration

- Define route changes
- Model potential impact on air quality and congestion
- Reconfigure routes
- Continuous performance monitoring of service quality, congestion and air quality
Application example: Smart Motorways

Managed motorway (M42, UK)
Application example: Pedestrianisation and restrictive vehicle access

Public transport access RFID control point (Cambridge, UK)
Case study: Demand allocation: Road and Light Rail

Feasibility study and modelling: Brunei
Application example: urban congestion charging

Urban charging point (trial system, London)
Application example: Compact Passenger Transport Interchange

Feasibility studies and modelling: Macau, Mexico and Brunei
Case study: Translink (Northern Ireland): Next Generation Ticketing

- Study to ensure ongoing innovation and to ensure that system remains ‘fit for purpose’ in long term
- Increased accessibility for residents and visitors: partial transfer of back office functions to 3rd party service providers
- Feasibility study: migration from current closed ticketing solution to open contactless EMV (cEMV) solution
- Economic evaluation: capital and revenue cost assessment
- Evaluation of the technical, security, legal and integration aspects of the NGT scheme
- Implementation planned by 2017
Case study: capacity improvement through signal optimisation

Feasibility studies and modelling of gyratory system (Brunei)
5. Future Transportation: from Intelligent Transport Systems to Integrated Transport Services
Current situation

- Vehicles are in use, on average 4-5% of their lifetime
- Vehicle capacity is not fully utilised
- Transport capacity is wasted carrying and storing unused vehicle capacity
  - US: High Occupancy and Toll (HOT) lanes
  - Car pooling / car rental / car sharing
- Infrastructure often planned for peak loading and challenges faced in managing that demand:
  - Congestion Charging and Electronic Road Pricing
  - Managed Motorways
- The traveller has the problem of assembling all of the components of a trip to make it work: long-distance coach, minibus taxis, rail, bus, driving, walking, etc. linked by roads, car parks, bus terminals, rail stations, etc.
Services convergence: a user perspective

WHAT IF ALL TRANSPORTATION WAS CONVERGED…
Services convergence: a user perspective

... AND TAILORED TO YOUR NEED AS MONTHLY PACKAGES
Differentiated integrated services

Urban commuter package for 95 € month:
- Free public transport in home city area
- Up to 100 km free taxi
- Up to 500 km rental car
- Domestic public transport 1500 km

15 minutes package for 135 €/ month:
- 15 minutes from call to pick up by shared taxi
- EU wide roaming for shared taxi at 0,5 €/km
- Free public transport in home city,
- Domestic public transport 1500 km

Business world package for 800 €/month:
- 5 minutes pickup in all EU
- Free taxi in home city
- Lease car and road use
- Taxi roaming worldwide

Family package for 1 200 €/month:
- Lease car and road use
- Shared taxi for all family with 15 minutes pickup
- Home city public transport for all
- Domestic public transport 2 500 km
Services design influence infrastructure design

**Mobility as a Service**
Service providers offering customised packages and capacity clearing user-centric services with reduced capacity wastage and reduced environmental impact, etc.

**Transport Operations**
Vehicles, public transport operators, parking operators, ride share operators, car share operators

**Infrastructure**
Design, location, size, engineering standards, reduced environmental impact, maintenance etc.

Feedback:
services design influences infrastructure provision
6. Summary & Conclusions
Summary & Conclusions

There is no common definition of a Smart City but all definitions focus on improved connectivity, support to city governance, broad deployment, and meaningful benefits to citizens and visitors – and businesses.

Consider how to prioritise investment:

- Aim to **improve resource productivity**: infrastructure, road users, commercial vehicle operators
- **Reduce operating costs** and benefit from economies of scale
- Contribution to a **livable city**
Summary & Conclusions

- Technology is not a panacea – be selective in how technology is used
- **Prioritise** the deployment of technology where its benefits are maximised
- Address institutional challenges early on: data sharing and coordination
- Tools include static and dynamic modelling and continuous monitoring to develop **quantitative understanding** of technical contributions and services to the management of Hong Kong’s transport and mobility infrastructure

Integrated transport and mobility services rather than comprehensive transport systems!
References and further reading - 2

Heitenan S. and Pickford A., MaaS Appeal, Thinking Highways, summer 2015 edition, H3B Media
Thank you!

For further information:

**MVA Head Office in Asia**

14/F West, Warwick House, Taikoo Place, 979 King's Road, Island East, Hong Kong

Email: [info@mvaasia.com](mailto:info@mvaasia.com)  
Web: [www.mvaasia.com](http://www.mvaasia.com)