Delivering Intelligent Transport Systems

Driving integration and innovation

Transport has a major impact on the quality of life in a city, its environment and the economy. Transport Authorities globally are facing similar strategic challenges around worsening congestion, insufficient transport infrastructure, affordability constraints, increasing emissions and growing customer needs.

To respond to this demanding environment, Transport Authorities can no longer depend solely on the traditional approach of building more infrastructure as this requires significant financial commitment as well as complex regulatory and environmental planning processes to manage (see Figure 1).

Consequently, Transport Authorities across the world are increasingly focussing on the use of demand management with schemes such as road user charging; and information and customer management techniques including enhanced traveller information services. This broader application of Information Technology (IT) provides an opportunity to drive innovation in the provision of transportation systems and services.

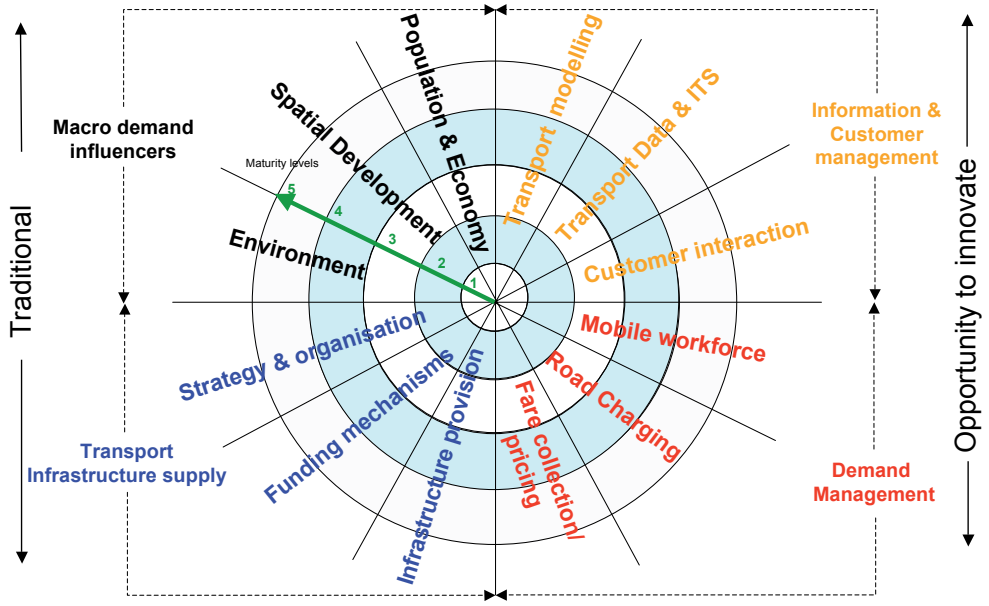

Figure 1: Transport Influencers Model

The current use of Intelligent Transport Systems (ITS) is often limited by a lack of an integrated and holistic vision. Traditionally, the implementation of ITS projects has been more tactical, focused on single transport modes using stand-alone proprietary systems. As Transport Authorities embark on increasingly complex mixes of IT investment to support the provision of their transport networks, there is a real need and opportunity to align the IT architectural framework with the business strategy and operational model to achieve a greater degree of system, data and service integration.

IBM believes that an integrated common framework uniting some of the key transport sub-systems will offer Transport Authorities the ability to better manage their network and provide integrated services to customers. This framework should make maximum use of open and common standards as well as adopting a Service Oriented Architecture approach, which simplifies future integration and inter-operability between transport systems.

In addition, the implementation of a new strategic transport project such as an Automatic Fare Collection (AFC) system or a Road User Charging (RUC) system allows the opportunity to utilise the new infrastructure as a base for future projects. For example, the Customer Relationship Management (CRM) component of a multi-modal AFC system can form the framework for other transport systems to integrate their customer data. The development of a new transport portal / website that provide trip advisory services and real-time information updates to customers is another example of how a strategic project can stimulate the data integration of other transport systems. These strategic initiatives can kick-start the development of a common framework that leads to improved customer services, reduced operational costs and increased revenues.

Intelligent Transport Systems at a turning point

Over recent years, ITS has played an increasingly important part in providing transport services more effectively. With its growing maturity, IBM believes ITS is approaching the next stage in its development where it will be influenced by:

- Greater integration between systems and modes
- Open and common standards, and a shared framework
- Service Oriented Architecture
- Increased customer services
- Real-time information sharing and responsiveness
- Demonstrable value for money

Transport Maturity Model

Based on extensive research and interviews with leading Transport Authorities globally, IBM has developed a Maturity Model based on the level of system, data and service integration across multiple transport modes. The Model enables authorities to view their business and ITS solutions holistically and capture their vision of where they would like to go to (see Figure 2). A profile of a typical Transport Authority has been mapped for reference.

		Level 1 Silo	Level 2 Single Mode Integrated	Level 3 Partially Integrated	Level 4 Multimodal Integrated	Level 5 Multimodal Optimized
strategic planning	**Planning**	Functional Area Planning (single mode)	Project-based Planning (single mode)	Integrated agency-wide planning (single mode)	Integrated corridor-based multimodal planning	Integrated regional multimodal planning
	Performance Measurement	Minimal	Defined metrics by mode	Limited integration across organizational silos	Shared multimodal system-wide metrics	Continuous system-wide performance management
	Customer Relationships	Minimal capability, no customer accounts	Customer accounts managed separately for each system/mode	Multi-channel account interaction per mode	Unified customer account across multiple modes	Integrated multimodal incentives to optimize multimodal use
real-time information creation capability	**Data Collection**	Limited or Manual Input	Near real-time for major routes	Real-time for major routes using multiple inputs	Real-time coverage for major corridors, all significant modes	System-wide real-time data collection across all modes
	Data Integration	Limited	Networked	Common user interface	2-way system integration	Extended integration
	Analytics	Ad-hoc analysis	Periodic, Systematic analysis	High-level analysis in near real-time	Detailed analysis in real-time	Multimodal analysis in real-time
	Payment Methods	Manual Cash Collection	Automatic Cash Machines	Electronic Payments	Multimodal integrated fare card	Multimodal, multi-media (fare cards, cell phones, etc)
real-time intervention capability	**Network Ops. Response**	Ad-Hoc, Single Mode	Centralized, Single Mode	Automatic, Single Mode	Automated, Multimodal	Multimodal real-time optimized
	Incident Management	Manual detection, response and recovery	Manual detection, coordinated response, recovery	Automatic detection, coordinated response and manual recovery	Automated pre-planned multimodal recovery plans	Dynamic multimodal recovery plans based on real-time data
	Demand Management	Individual static measures	Individual measures, with long-term variability	Coordinated measures with short-term variability	Dynamic pricing	Multimodal dynamic pricing
	Traveller Information	Static Information	Static trip planning with limited real-time alerts	Multi-channel trip planning and account based alert subscription	Location-based, on journey multimodal information	Location based, multimodal proactive re-routing

Figure 2: Multimodal Network Management Maturity Model

IBM's ITS experiences

IBM's experience of developing ITS solutions includes the delivery and operation of the Stockholm Congestion Tax Project, Singapore's Automatic Fare Collection back office systems, the UK Driver and Vehicle Licensing Agency's Electronic Vehicle Licensing system and a leading UK insurance company's usage-based insurance model.

Case Study: Congestion Charging in Stockholm

The Swedish authorities required a system that would automatically tax Swedish registered vehicles entering and leaving the city centre between 06.30 and 18.30, Monday to Friday (excluding national holidays). The target was to reduce congestion by between 10% and 15%.

The biggest challenges during the design and implementation process were the tight time frame, political sensitivity and public scrutiny. The trial was to be followed, in September 2006, by a referendum for Stockholm residents to decide whether to implement the congestion tax permanently. It was crucial that the trial brought tangible, measurable benefits and won over its users.

The trial itself launched on time and ran without interruption through to its end on 31 July 2006. It not only met its objectives – it exceeded them.

- Traffic congestion in Stockholm was reduced by 25%, far above the original target
- Traffic queuing times fell by up to 50%. Journey times were faster and more predictable
- Stockholm bus timetables were re-written to take improvements to traffic flow into account
- Pollution levels in the city fell by between 10% and 15%
- Confidence in the system was high due to minimal enforcement and administrative errors

When the trial ended, a majority of Stockholm residents voted in favour in the referendum. This was the first time that the residents of a European city have elected to adopt road charging. As a result, the Swedish parliament decided to introduce the system permanently. Following the parliamentary process and some enhancements, the scheme was relaunched in August 2007.

Case Study: DVLA's Electronic Vehicle Licensing system

The Driver and Vehicle Licensing Agency (DVLA) sought to deliver higher levels of customer service at a lower cost through a new online channel for vehicle licensing. Implemented over 12 months, the innovative project won several awards including the UK e-Government Award for Central e-Government Excellence in 2006.

Its benefits include:

- Reduction in licensing processing time
- Reduction in cost of vehicle licence renewal
- Easier compliance for motorists
- Faster renewals through integration with insurance companies and other government agencies.

Investment in ITS innovations

IBM is investing in several Innovation Programmes that focus on the next generation of ITS solutions: Global Innovation Outlook and InnovationJam. The InnovationJam programme is being used to design and in-market test the next generation of road user charging systems – Innovative Transport Pricing - and to develop advanced information management solutions for end-users and transport operators – Advanced Transport Information Management (see Figure 3).

IBM's global Innovative Transport Pricing project is focused on the technology roadmap for road user charging from City based schemes through to time, distance and place schemes at a national/state level. It is addressing the operational and technology challenges of scale, privacy, accuracy, interoperability, enforcement, total cost of ownership and critically the migration from individual schemes through to national schemes.

IBM is running several co-invested trials with Transport Authorities globally. An example is the Traffic Prediction Pilot in Singapore (see case study below).

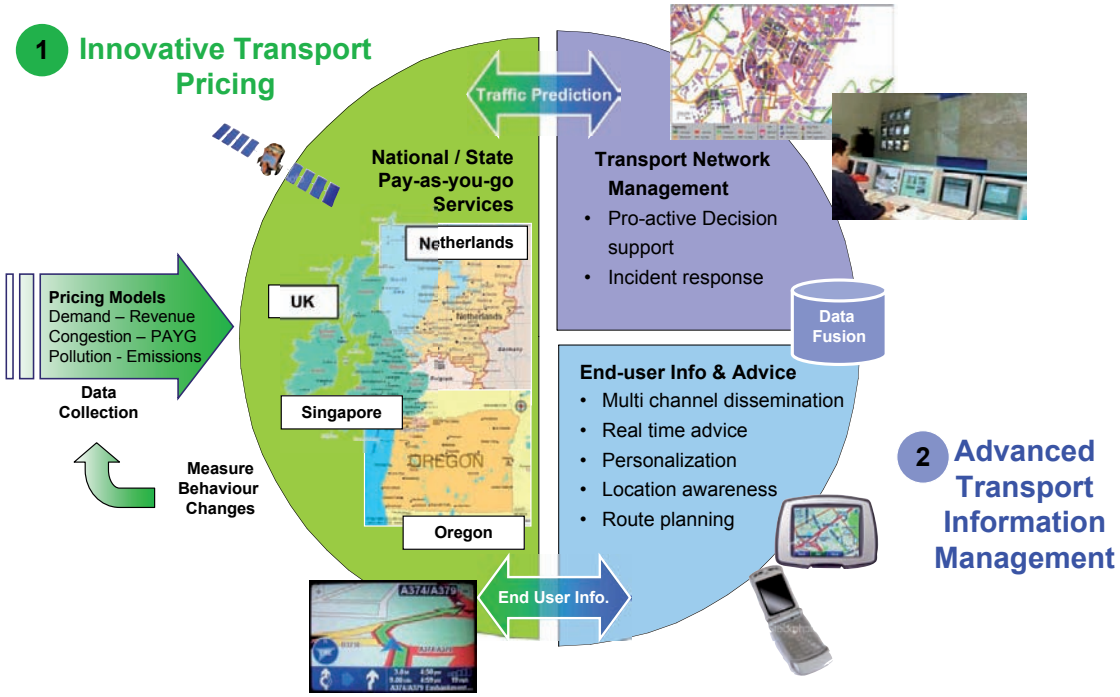

Figure 3: IBM Innovation Programme for ITS solutions

Case Study: Traffic Prediction Pilot in Singapore

Even though Singapore has one of the most advanced traffic management systems in the world, the Land Transport Authority (LTA) is constantly looking for innovative solutions to expand on and improve its range of traffic management tools to keep traffic flowing.

Through IBM's Global Innovation Outlook programme, the LTA and IBM co-invested in a pilot to predict traffic flows in Singapore's central business district (CBD). Using historical traffic data and real-time traffic input from the LTA's i-Transport system, IBM's Traffic Prediction Tool predicted traffic flows over pre-set durations (10, 15, 30, 45 and 60 minutes). Both speed and volume predictions covering the CBD were above the target accuracy of 85%. In addition, during peak periods where more real-time data was available, the average accuracy of the volume forecasts on the CBD was near or above 90% from 10-minutes all the way to the predictions 60-minutes into the future.

With these predictions, LTA's traffic controllers will be able to anticipate and better manage the flow of traffic to prevent the build-up of congestion.

IBM Solutions
IBM has a team of over 200 ITS specialists providing the following types of services and solutions to Transport Authorities globally:

- Transportation IT Strategy Consulting
  - Transport Maturity Model
  - Integrated ITS framework

- Road User Charging
  - Project management, scheme implementation and operation
  - Urban and Time Distance Place road charging solutions
  - Total cost of ownership models

- Automatic Fare Collection
  - Project management and implementation
  - Global partners

- Transport Information Management
  - Single and multi-modal
  - Network management and end-user sharing

- Asset Management
  - IBM Maximo Asset Management
  - Management modules in asset, work, service, contract, materials and procurement management

These solutions allow Transport Authorities to optimise their networks leading to improved customer services, reduced operational costs and increased revenues.

For more information
To learn more about IBM's Intelligent Transport Systems, please contact your nearest IBM representative:

UK
Jamie Houghton
E-mail: jamie.houghton@uk.ibm.com
Tel: +44-7718-778662

Clare Jack
E-mail: clare.h.jack@uk.ibm.com
Tel: +44-7808-783308

EMEA
Gunnar Johannson
E-mail: gunnar.s.johansson@se.ibm.com
Tel: + 46-8-7935729

Colin Lim
E-mail: colin.fw.lim@uk.ibm.com
Tel: +44-7966-265759

Americas
Naveen Lamba
E-mail: naveen.lamba@us.ibm.com
Tel: +1-703-362-6037

Asia-Pacific
Adrian Tee
E-mail: teekta@sg.ibm.com
Tel: +65-9008-9474

IBM United Kingdom Limited
76 Upper Ground
South Bank
London
SE1 9PZ

The IBM home page can be found on the Internet at
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