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Information strategies within Transport for London

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Introduction

Transport for London (TfL) is a new organisation that came into force in 2000. It was formed from parts of ten predecessor organisations that were providing transport services including buses, trains, taxis, river ferries and the main road network. The objective was to provide London's new Mayor with control over all the relevant transport agencies in London, leading to a unified service for the travelling public. TfL has six main businesses – Street Management (for the main roads), Rail Services, Surface Transport (Bus, River and Taxis), the Underground (after transfer from Government), Performance and Finance, and Communications. The Greater London Authority also has links to the Metropolitan Police and an important feature of this connection for GIS is the way that traffic information is gathered and processed.

The previous organisations were developing information systems, using GIS, and this work continues in TfL. The approach is to develop objectives and strategies for service delivery across the range of the TfL services. The uses and requirements for GIS are derived from these objectives and strategies on a business by business basis.

I am Managing Director for Street Management, responsible for 550 km of London's busiest streets that carry about one third of London's road traffic. Most of the examples of GIS that are given below come from Street Management, but there are also some examples from bus operation and rail services.

The Mayor's Transport Strategy

The Mayor's Transport Strategy was adopted in July this year and this document guides all the work of the TfL businesses. Of particular relevance for the application of GIS is the Mayor's vision of developing London as an exemplary sustainable world city based on:

- Strong and diverse economic growth
- Social inclusivity to allow all Londoners to share in London's future success
- Fundamental improvements in environmental management and use of resources

The TfL businesses will be using GIS as a tool to achieve this through better planning and management of the resources and through providing better information for the travelling public. The Strategy seeks to encourage a shift to public transport and accurate real time information on incidents and future events on the road network and on bus arrival times, for example, will contribute to this.

Planning the Services

As with other major organisations the use of GIS has become a standard tool for planning purposes within TfL. Mapping is the preferred approach to analysing transport and access problems and evaluating alternatives.

One example I illustrate is the use of household information from the Census in bus route planning. The Mayor's Transport Strategy calls for an accessible transport service and social inclusivity. By the end of the year half the bus fleet will comprise new buses with low entrances and ramps for wheel chair users. A programme of upgrading kerb layouts and imposing parking and loading controls allows the buses to get close to the kerb. This makes them easier to board and alight, particularly for the elderly and infirm. Information on the distribution of households with elderly residents has been used to identify the priority for allocating new buses and the access improvements at the bus stops.

A congestion charging scheme is proposed for Central London to reduce congestion levels and free up the roads for buses and the other remaining traffic. This is planned to come into operation in 2003. A £5 charge will be levied on drivers who come into or drive within the central area. A reduction of 10% to 15% in traffic flows in the charging area is expected and this will produce significant benefits from reduced delays and more reliable journey times, particularly for bus operations.

GIS has been an essential tool for designing the scheme and for supporting the extensive consultation that has been necessary.

The Transport Strategy calls for major new developments to be located at sites where there is good public transport. Many of the London boroughs use a simple GIS based mapping system to identify the accessibility of their development sites to the public transport network. This is used for assessing planning applications and also indicates gaps in the public transport network. Staff within TfL have developed a more complex approach which I illustrate. This system can give a measure for each development site of the land uses that can be reached using the public transport services. The output can show, for example, the population of working age within a given travel time of the specified site. This approach provides a more effective way of determining whether a site can support major new offices or other development.

Managing the Systems

Within Street Management GIS is common and it is normal for the managers, engineers, and technicians to use GIS linked to powerful databases to map a range of features, equipment and conditions. These systems have been developed by the predecessor organisations. In developing this further a need has been recognised to provide a common framework, using a proprietary GIS and linked to proprietary database but building upon the existing application-specific tools. The key elements that we have agreed are to adopt a common framework for GIS and to develop GIS as a common front-end interrogation tool for users. Applications and their acronyms within Street Management using GIS and a common database are diverse and include:

- Asset management database – a proprietary system provided by EXOR.
- Streetworks database – Management Information System for Streetworks (MISS).
- Traffic Control maintenance management system.
- Events database – London Traffic Information system (LTIS)
- Accident database - London Accident Analysis Unit (LAAU).
- Enforcing bus lanes – Bus Lane Enforcement Cameras (BLEC)

There are 4,200 traffic signals installations in London over an area of 1,579 sq km. The maintenance budget is over £13m. GIS is used as a common feature of the maintenance systems for both the traffic signals and the traffic signs. Bar code readers are used in the field to log sign data, linked in to a GIS database. This database is used to plan the maintenance work and monitor performance. Current performance standards are a 99% availability for effective traffic signal functioning, with 95% availability for all the elements of traffic signals (all lamps, detectors, indicators etc) functioning at a site.

Streetworks cause a high level of disruption as the gas, electricity and the other statutory undertakers open up the road to get at their equipment. The problem has been recognised for many years and various approaches have been followed. During the nineties the Government worked on a national GIS scheme for

Streetworks but cost and technical difficulties led to this being abandoned before it was completed. Within London the Management Information System for Streetworks (MISS) is more modest approach that is being developed as a voluntary scheme that will allow better co-ordination of streetworks. The statutory undertakers and the highway authorities will be able to co-ordinate their work using a GIS database. In the short term non –technical local authority staff will be able to access information on particular jobs quickly and be able to deal with queries from the public and other interested agencies immediately.

The initial objective of the MISS project was to design an implement a prototype computer system that would demonstrate the potential of a map-based system to provide improvements in the management and co-ordination of Streetworks at both a Local and Strategic Authority level. The objective of the prototype system was to prove that it was possible to:

- Assign accurate geographic co-ordinates to the work locations provided in the Street Works notices
- Develop a map-based management system that was suitable for a variety of users involved in the management of Streetworks.

Both objectives were achieved and the prototype scheme is now working with five London boroughs. The next stage is to expand this to 16 boroughs and then roll it out to all the London boroughs in 2002.

The London Accident Analysis Unit analyses the information recorded by the Police on London's 40,000 crashes each year. This information, all specified by location, is vital for identifying accident hot spots and designing revised road layouts to reduce crashes and collisions. This system has been developed over 20 years and the underlying architecture and operating systems are outdated. As we move to a Windows based system with new soft and hardware it is clear that the key factor will be maintaining the service. The design engineers in the boroughs and within Street Management will continue to need information on locations and details of accidents in order to introduce remedial measures. Development will be evolutionary with new systems coming in that are tried and tested before the current ones are abandoned.

Traffic/Travel Information

Processing traffic information will, I expect, become an increasingly important activity for TfL.

The users of the road and public transport systems within London can use traffic and travel information to be more in control of their journey, deciding on the most efficient and economical method of transport, the most sensible route avoiding any possible delays and the best time to travel.

Travellers will be able to enjoy better transport services with more easily accessible call centres or Internet access, which provide more up-to-date, accurate and reliable information for planning journeys and booking and paying for tickets where required.

The managers of the highway and traffic control systems can use traffic information for traffic management purposes, for example to alter signal timings across the network to reflect traffic levels. The historic data is used for planning and strategic purposes.

The main types of information that is available are:

- Police Incidents - accidents, road closures, gas leaks, burst water mains, fires, diversions, unsafe buildings, other incidents
- London Buses - reported incidents from 5,500 bus operatives throughout London
- NRSWA - National Roads and Street Works Act (provides details of roadworks throughout London)
- Diary of Events - marches, demonstrations, football matches
- Faulty Automatic Traffic Signals - traffic signals not operational
- Signal Control Data - Urban Traffic Control System
- Traffic Congestion – Urban Traffic control and other road information systems

- External Data from traffic regions outside London
- Highways Agency – Traffic detection and traffic information through the Traffic Information Highway
- Access Control Data - car park systems data for future park and ride schemes
- Low Bridge Data - diversion of over-height vehicles
- Vehicle Information - traffic counts, vehicle classification
- Environmental Information - pollution, emission and noise monitoring
- Public Transport data - rail, tube, bus, river, air, timetables and delays
- Countdown - automatic vehicle location / bus information system
- ROUTES - London Transport pre-trip journey enquiry system
- Trafficmaster - route guidance and navigation system
- Major Events - eg the opening of Parliament
- Tourist Information - eg places of interest
- Hotel Information - eg availability, locations and prices

In addition there are two sources of processed information :

- Variable Message Signs (London Driver Information System)
- CCTV / Jam cameras via the internet / Enforcement camera data

With the development of Intelligent Transport Systems or Transport Telematics, the efficient gathering of accurate and relevant information with timely processing, integration and dissemination, provide a powerful tool for managing the roads as well as providing traffic information for travellers.

The London Traffic Information System (LTIS)

With increasing numbers of people living in London, working and travelling in London, increasing numbers of vehicles on the roads, London has been facing a similar challenge as most capital cities for many years. People are demanding more choices and reliable alternatives to using their cars. An essential aid to assisting in this goal is high quality multi-modal real-time traffic/travel information, which allows informed decisions regarding where, when and how people travel.

Organisations associated with operating the traffic systems have come together to improve the Metropolitan Police Service (MPS) congestion log which had been installed mid - 1980. The congestion log was effectively a text editor, typically containing up to 20 pages of text, detailing events entered manually by the MPS Traffic Collator. It had limited facilities for processing, prioritising or archiving the information which was automatically deleted each day. Incompatible data sources led to the duplication of data and conflicting data with poor data processing.

A trial was carried out in 1998 with the London Traffic Control Systems Unit (TCSU), the Metropolitan Police Service (MPS), and London Buses (LB). The objective was to replace the existing congestion log and provide a more versatile, user-friendly system for London's traffic information. This became known as the London Traffic Information System (LTIS).

The key aim of LTIS is to facilitate the distribution of accurate, relevant and timely traffic information to various outlets including the media.

The key benefit is that the travelling public become better informed and this is achieved via a system that is:

- User friendly - allowing archiving, prioritising, event linking and grouping
- Efficient - faster to enter data and distribute to the users
- Effective - one source of more timely and accurate integrated information
- Versatile - user configurable, compatible with new technology/development

The media can disseminate the LTIS traffic information to the public and transport organisations in a variety of ways:

- Radio broadcasts
- Television broadcasts
- Teletext transmissions
- Internet WEB sites
- WAP phones
- Digital Radio
- Hand held GIS data displays

An Integrated Traffic Control Centre

TfL Street Management has started a programme for an integrated London Traffic Control Centre to co-ordinate the organisations involved in managing the main road network in London. This centre will co-operate closely and be linked to the London Buses CentreCom Control Centre and the TfL Travel Information Centres to provide an inter-modal, multi-media, live-route information service that provides a fully integrated transport choice to the travelling public.

GIS and the Bus Passenger

Every weekday four and a half million journeys are made on buses in London and the Mayor's Transport Strategy seeks to increase this. One of the biggest challenges to bus travel is the uncertainty over the time the bus will take to arrive, and how long the journey will take. TfL has comprehensive programmes of bus priority with a vigorous enforcement system using on-bus cameras and closed circuit television cameras, traffic management measures and the proposed Central London Congestion Charging Scheme that are designed to reduce the delays to buses from traffic congestion. These efforts are expected to reduce the current levels of delays but passenger will continue to experience some variation in waiting and running times.

TfL is introducing the Countdown time to next bus display system at bus stops throughout London to provide the passenger with better information on how long their journey and early warning of long gaps in the service. The Countdown system consists of a GIS based automatic vehicle location system (AVL) and bus stop displays showing the expected time to the next bus for the routes that serve the stop. Central processors calculate the time each bus is expected to take to the next stop based on the distance and the time taken by previous buses. This is updated to reflect changing traffic conditions. The AVL system will also be used increasingly for management purposes – providing more effective route control than the current road-side inspectors.

This is a £45m project that will provide AVL for all of the 6,500 bus fleet and 80 plus garages by the end of this year. Countdown displays will be installed at 4,000 (25% of the total) stops by 2005. This will benefit 60% of London's bus passengers.

The main benefits of Countdown are that it provides real time information to passengers. This provides reassurance and reduces the perception of long waiting times. When similar schemes were introduced on the underground market research showed that the perceived disbenefits of the wait for the next train was

reduced by a half when the passenger knew the length of time. Clearly providing time to next vehicle indicators is good value compared with increasing service frequencies. Market research for Countdown on the buses all indicates a high degree of customer satisfaction.

Developing GIS within Transport for London

The proliferation of GIS within the different elements of TfL has been rapid and GIS is now seen as a standard approach to many of our management and development initiatives. There remains the challenge to better integrate and co-ordinate out work across a newly formed institution. Getting traffic and travel information out to a wider public is seen as a significant benefit. The approach that we are following is:

- Seek open data standards.
- Seek partnerships with other organisations – organisations that can supply information or "carry" our information out to their audience.
- Pursue agreements on data sharing and an open exchange with partners. Outside of private commercial pressures and with a general duty to improve travel within London there is benefit to TfL in making information widely available.

Conclusions

I hope that I have shown that GIS and mapping is widely used within TfL; it has reached the stage where it is unremarkable, as normal as word processing. It is used almost universally as a basic tool.

The applications are enormous. It does provide a powerful way of dealing with a range of problems. An open approach is required for its successful development, one that deals with how the systems communicate with each other and use agreed data exchange standards.

For TfL a key feature has been the need to keep essential services running. An evolutionary approach that builds upon the existing services, introducing compatible new systems when the have been tested has proven successful and is the approach I expect to see continued.

The author would like to state that any views expressed within this paper are entirely his and are not necessarily those of TfL or any other organisation.