Report to the DTO RTPI Committee

A Strategy for Integrated Public Transport Information, including Real Time, in the Greater Dublin Area

ATKINS

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Executive Summary

The Transport Strategy *A Platform for Change* published by the Dublin Transportation Office (DTO) predicts a four-fold increase in public transport journeys by 2016. Much of this growth will come about through the implementation of major improvements in public transport infrastructure across the Greater Dublin Area (GDA). *A Platform for Change* recognises that a range of new travel choices using metro, tram services, bus services in priority lanes, and improved train services is not sufficient in itself. Passengers will start to plan point-to-point journeys involving different modes, requiring interchange, in a city where travel options will change and improve as the strategy rolls out. People will therefore need information about:

- Where public transport services go
- How to access them;
- When they run;
- How modes and services connect with each other.

The traveller also needs reassurance while travelling – how long till the next bus or tram? Where am I now? What is my expected arrival time? Will I make my connection? Providing Real Time Passenger Information (RTPI) will not only give this reassurance, it will affirm that a co-ordinated approach is being taken by the authorities in marketing the public transport network to the travelling public.

Although operators are currently pursuing some public transport information initiatives, these are taking place on individual modes within individual operating companies. These individual projects require to be co-ordinated so that information on the network is generated. Atkins Consultants have produced this report to recommend to the DTO RTPI Committee, established by the then Department of Public Enterprise in December 2001, a strategy for the provision of an integrated multi-mode Public Transport Information (PTI) /RTPI system for the GDA. In conducting the study, a consultation process involving operators, authorities and other interest groups found that there is a general desire for strong leadership as a catalyst to make progress. The Minister of Transport's statement on public transport reform of 7 November 2002 has been taken into account. This report identifies a series of integrated technical and managerial initiatives that will ultimately see:

a) The establishment of a new Public Transport Information Unit within the Regulator's Office to co-ordinate and manage all aspects of PTI from data collection to timetable publishing to branding across the entire network.

b) Improved quality of static information provided at bus/tram stops and train stations;

c) Provision of satellite tracking technology on the public transport fleet to drive real-time electronic "next departure" signs at initially up to 1,500 locations, mobile phone and internet services, on-board message indicators, and the capability to implement traffic signal priority requests for street-running public transport services.

d) Co-ordinated essential radio communications procurement across all modes and operators.

Costs

This comprehensive system has been estimated to require investment of c.€37m, and will take 6 years to roll out to completion. Atkins has estimated that some €21m of this could be borne centrally, assuming that the proposed P.T. Regulatory Authority takes ownership of all bus stops within the GDA, and decides to display real-time information at 1500 of them. This single activity accounts for 46% of the total system cost. The estimated total cost also includes the costs of

- currently planned schemes at individual operator level, for which funding is currently being sought, (e.g. RTPI project promoted by BAC amounting to €n),
- projects that are underway, (e.g. RTPI on Luas, amounting to €7.4m) and
- allowances for future projects in the rail system, the definition of which awaits the outcome of future studies (€5m allocation made).

Table 1 shows the allocation of total system costs (€million) between Authorities (either Local or Regulatory) and P.T. Operators (shown in more detail in Figure 8.1) on the basis of tasks that are the responsibility of each participant to carry out.

Element	Authorities		Operators	Total
	Local	Regulatory	P.T. Operators	
Branding, integration-proofing, set-up, design, specification, study activities	0	2.2	0	2.2
Bus Pole replacement programme	2.350	0.15	0	2.5
Bus tracking systems	0	1.1	2.7	3.8
Traffic signal priority	0.4	0	1.2	1.6
Rail and Tram projects	0	0.1	5.0	5.1
RTPI displays at bus stops	0	15.0*	0	15.0
RTPI displays at interchanges	0	1.84	0	1.842
On-vehicle displays	0	0	4.5	4.5
Telecommunications	0	0.36	0	0.36
Total	2.75	20.75	13.4	36.9

* Assumes 1500 of the c.5,500 bus stops in the GDA, now in the stewardship of the Regulatory Authority, have real – time displays.

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It should be noted that once set up, integrated information systems require maintenance. Bus and rail timetables change, routes are lengthened or shortened, new routes and services are introduced – as in the case of Luas next year, new modes are introduced from time to time. The information system must be updated to reflect the evolution of the network

in an accurate and timely way. Therefore, capital investment in setting up the proposed information system must be matched by operating investment to maintain and enhance the data it is built on.

The report has concluded that a proportion of the funding could come from operators. There is scope for private investment, however further work is required on the nature and timing of such investment.

Benefits

The benefits to current passengers of reliable public transport information are that both waiting, and the uncertainty normally associated with waiting, can be reduced. However, the provision of reliable and timely public transport information to people at the point of deciding where, when and how to travel has been shown to increase ridership, and potentially revenues. For example, in Oslo, the effect of providing a *Trafikanten,* or one-source public transport information call-centre / website was that 12% of those who used the service in 1999 stated that they would not have used public transport without it. The revenue accumulated from the new trips exceeded the cost of operating *Trafikanten* by 60% in 1999. The integrated web-based journey planner provided by TfL for Londoners has had recently to increase the number of servers from 1 to 5, to cater for the rate of growth of use of the service.

In addition, major benefits for operators, regulators, traffic managers and planners are also available by the use of even before a single electronic sign is placed at a stop. These include:

- Analysis of route operations to give better service frequencies, more cost effective vehicle and driver utilisation, (and if combined with ticketing data) trends in patronage;
- A step-change improvement in the accuracy of timetables;
- Network, service, and franchise performance monitoring;
- Reductions in costly surveys;
- Substantial improvement in the quality of data used to promote public transport schemes: e.g. identification and quantification of congestion blackspots for public transport services leading to more effective priority for buses, trains and trams.

Upon acceptance of this report by the RTPI Committee, it is recommended that the next step should be to establish the PTI Management Committee, with a budget of €2.28m from exchequer funds in 2003 to resource and realize the initial work of the PTI Office. Unequivocal relationship lines between the PTI Office it and other sectoral players should also be defined. The DoT should agree a programme with the PTI Management Committee assisted by the PTI Office for the delivery of:

- The design, production and installation of network maps and local area maps at major rail stations and bus stops, to be agreed with operators.
- The design, production and launch of a common website and timetable directory/reference book of all licensed and exempted public transport services in the Greater Dublin Area.
- A brand for integrated PTI in the Greater Dublin Area.

- A set of boarding point design guidelines for all public transport modes including taxi
- A set of conditions pertaining to the domain of information for future franchisees and licensees within the bus network to participate in the integrated PTI system for GDA
- A study to determine the optimal communications network and the most cost effective implementation approach for RTPI development
- A study to determine how to integrate legacy proprietary PTI & RTPI platforms on the rail network into the overarching multimodal PTI and RTPI strategy.
- A study on alternative financing options, encompassing greater operator, passenger and private sector involvement, to exchequer funds to deliver on this 6 year strategy.

Furthermore, an immediate moratorium on exchequer funding of individual public transport operator PTI and RTPI initiatives should be put in place. This suspension should last until examination of each scheme's integration potential within the strategy is undertaken. Any future public funds should be channelled through the PTI Managing Committee. This will not however preclude operators from funding their public transport initiatives from 'own resources'.

People need timely, accurate, reliable information on all the travel choices available to them. If public transport is to substantially increase its market share, more people must become familiar with it, and be satisfied with using it. But what the passenger sees is the tip of the iceberg. A co-ordinated effort is required by operators and administrators to generate, maintain, exchange and process data to provide this information to passengers. Commitment, time and resources are required both initially and on an on-going basis. Without this the transport objectives set out in *A Platform for Change* will not be achieved.

1. Introduction

1.1 Background

The Dublin Transportation Office (DTO), at the instigation of the Department of Transport (DoT) established a committee[1] in December 2001 to further the implementation of Real Time Passenger Information Systems (RTPI) in the Greater Dublin Area (GDA). The terms of reference[2] of the Committee enabled the scope of its work to include all Public Transport Information (PTI) including Real Time Passenger Information (RTPI). In June 2002 the committee appointed consultants[3] Atkins to carry out a study to advise on the formulation of a multi-mode Public Transport Information (PTI) / Real Time Passenger Information (RTPI) strategy for the GDA. This report forms the outcome of the study.

The GDA is defined by the Strategic Planning Guidelines[4] (SPG), the current regional plan for the area. The SPG, envisages the development of a Metropolitan Area and a Hinterland Area. Within the Hinterland Area, self-sustaining development centres are proposed.

1.2 Why undertake a study on integrated PTI / RTPI?

The PTI / RTPI Committee believe that it is timely to undertake a study leading to the formulation of an integrated PTI strategy for the Greater Dublin Area for a variety of reasons:

- The current level of information in the GDA is inconsistent in terms of presentation and content. The quality and accuracy of information is an important attribute of public transport. Market research has shown that information is important to passengers[5]. Following implementation of the DTO Transport Strategy 2000-2016 *A Platform for Change,* use of public transport services is predicted to increase almost fourfold. New and existing users travelling more frequently and further afield, will require integrated information that will help them to use the developing services as a network.
- Within 18 months, Luas will be introduced in Dublin. The last such major addition to the transport network was the introduction of DART in 1984. Luas will derive a proportion of its patronage from interchanging passengers from other public transport modes which could be quite large. Studies in Croydon (UK) have shown that 42% of Tramlink passengers boarding at Wimbledon had interchanged from bus or train.[6] The integration of Luas into the existing public transport network will generate a requirement for an integrated PTI multi-mode information system, so

[1] The list of Committee members is given in Appendix A.
[2] The terms of reference are provided in Appendix B
[3] The Brief to Consultants is provided in Appendix C.
[4] Strategic Planning Guidelines for the Greater Dublin Area, Report by Brady Shipman Martin, et al to Department of the Environment and Local Government, 2000
[5] First Bus, presentation to ITS (UK) seminar on Developments in Scottish Passenger Information Systems, Edinburgh, 27 November, 2002
[6] Croydon Tramlink 2002

that awareness of how the new mode interacts with existing modes can be raised.

- The development of new technologies offers new opportunities to communicate information to passengers. Increasingly the public expects service industries to take advantage of them. Existing types of information can be more widely disseminated and new and expanded items of information, especially in real-time, can now be easily communicated to existing and new passengers.

Across the transport sector new technologies known as Intelligent Transport Systems (ITS) projects are either on-going or being initialised. Customers of all modes of transport expect that these systems will be integrated, so that information on all options to travel between two points can be presented. It would be important that the managers of these projects ensure that each is developed on open platforms, permitting easy accurate transfer of data between systems. This foresight will avoid the potential waste of usually public funds involved in re-specifying such systems for interoperability in the future. There is potential to share costly infrastructure, and to expand the functionality of equipment purchased for one application to include others.

On a related issue, the changing regulatory environment within the urban bus sector precludes the development of any one PTI system for the exclusive use of one operator. Easily accessible and complete information should be made available to passengers and prospective passengers independent of who will eventually deliver the service.

The view of the Committee was that further investment in systems and effort to extend PTI to include information in real-time to passengers and intending passengers would be worth considering for the following reasons:

a) The added benefit of reducing uncertainty and waiting time to passengers and intending passengers through informing them of the current status of their routes and services, diversions and disruptions, would be significant.

b) The opportunity to enhance operator efficiency, regulatory management, and transport planning. RTPI systems are built upon the ability to track and locate all the equipped public transport vehicles. Data is generated on route and vehicle performance that can be comprehensively analysed at every level from “on-the-fly” decisions to bring into service additional buses to meet demand, to long term improvements in timetable quality and accuracy. Considerable benefits and cost savings are possible. The potential improvement in system efficiencies that could accrue to operators in the GDA may result in reduced requirements for subsidies on a per passenger carried basis.

The Committee decided that these societal and technological changes and developments represent real justification to develop a strategy to improve passenger information systems, and to extend these to ultimately include RTPI.

1.3 The Task

The consultant was asked to develop a PTI (including RTPI) strategy based on the principle that comprehensive and accurate information on all public transport services should be made available:

- to both passengers and intending passengers;
- at all stops / stations in the public transport network, and homes and at major interest points throughout the conurbation of Dublin;
- using all forms of media, including electronic forms.

In addition, the consultant was asked to identify the benefits to operators, to the urban transport planning sector and to society in general from specific investment in RTPI. During the course of the study an important Ministerial statement on the future regulatory environment for public transport has been made which has also been taken into account.

1.4 Report Structure

Following this introduction there is a chapter detailing the work and methodology approach taken for the study.

In Chapter 3 the requirements of passengers and stakeholders (agencies, authorities and operators) are examined and a vision statement for PTI in the GDA is proposed. Using an analysis of the current situation and taking on the results of a Stakeholder consultation exercise Chapter 4 provides a definitive opinion on the base from which to develop the PTI/RTPI strategy.

Chapter 5 is a key chapter. It states what needs to be done. Chapters 6 and 7 set out the scale of the recommended intervention. Chapter 6 describes the individual components of a new system, effectively the information and communications technology (ICT) 'building blocks', and also describes the necessary physical channels between those components. Chapter 7 describes the new responsibilities and roles of existing players in the transport sector; the new aspects to relationships between them; and makes a case for a new body. The 'process re-engineering' described in Chapter 7 enables the potential benefits in the technological systems described in Chapter 6 to be realised. The new business processes described in Chapter 7 are required prior to the establishment of the public transport regulator proposed by the Minister of Transport in November of this year.[7] Therefore Chapter 7 also describes how the proposed arrangements could migrate to the regulatory body.

Chapter 8 details the costs, timescales and benefits of the strategy. Chapter 89 considers sources of funding. The main findings of the study are summarised and the next steps presented in Chapter 10.

There are five appendices to the report. Appendices A to C concern the PTI/RTPI Committee, its membership, terms of reference and the brief issued to the consultant.

[7] Statement on Public Transport Reform by Seamus Brennan T.D, Minister for Transport dated 7 November 2002

Appendix D contains examples of good practice drawn from throughout Europe and is a companion to Chapter 3.

Appendix E provides a synopsis of the consultation exercise carried out in June and July 2002 with potential stakeholders.

Appendix F provides some information on the organisational structures in other parts of Europe where RTPI has been, or is being, realised.

2. Study Structure

2.1 Approach

The starting point for the study was to examine the policy background and statements in the transport domain.

The study was informed by the following key documents:

- The DTO transport strategy 2000 – 2016 *A Platform for Change* was published in September 2000. It recommends a greatly expanded multi-mode public transport network for Metropolitan Dublin, and high quality bus and rail networks linking this network to the Hinterland Area of the GDA. The strategy also envisages a significant change in modal split for public transport modes, and recommends the provision of high quality integrated public transport information systems, both fixed and real-time, to aid in bringing about this modal shift.
- The Department of Public Enterprise policy paper *A New Institutional and Regulatory Framework for Public Transport* (also known as "The Red Book"), August 2000. This paper sets out a proposed framework for institutional and regulatory reform of public transport in the State.
- The Department of Environment and Local Government / Department of Public Enterprise consultation paper *New Institutional Arrangements for Land Use and Transportation in the Greater Dublin Area* (also known as "The Blue Book") March 2001. This paper considers the institutional arrangements for land-use and transport in the Greater Dublin Area.
- The 'Statement on Public Transport Reform' by Seamus Brennan T.D., Minister for Transport, delivered at a meeting of the Public Transport Partnership Forum, 7 November 2002. This statement affirms that an independent body will be established to procure public transport services and regulate public transport for the Greater Dublin Area. The precise institutional form of this body is currently under consideration.

2.2 Key tasks

Key tasks that were identified by the DTO/DoT for the consultant to undertake in meeting the brief were:

- Extensive stakeholder consultation[8];
- A review of the current and planned PTI and RTPI projects undertaken by public transport operators;
- The identification of a high level system and business architecture describing who should provide and present information, what and where information should be presented and how all the technology used to generate and process data and present information should work together;
- Identifying suitable projects, their costs and benefits and a prioritised programme for their implementation;

[8] See Appendix E for a full account of the stakeholder consultation process

- Assessing the regulatory and institutional implications of the study recommendations

Atkins has also undertaken to formulate a strategy that meets the following requirements

- One source for all the information a traveller may need (including payment);
- Is multi-modal in outlook, including connections and walk links;
- Is accessible through multiple media;
- Is socially inclusive;
- Is supported by operators / authorities / business / Government;
- Delivers PTI (including RTPI) on a par with other leading city regions.

2.3 Methodology

The methodology for the study is described in Figure 2.1 overleaf. It is essentially a three-stage process:

(i) Obtain data and stakeholder opinion from within the GDA, and research examples of good practice;

(ii) Review information gathered and produce initial ideas on appropriate projects and tasks for discussion;

(iii) Produce draft final report and iterate to a final strategy for dissemination and publication.

There will also be a number of presentations of the agreed strategy to interested stakeholders and to the PTI / RTPI Committee

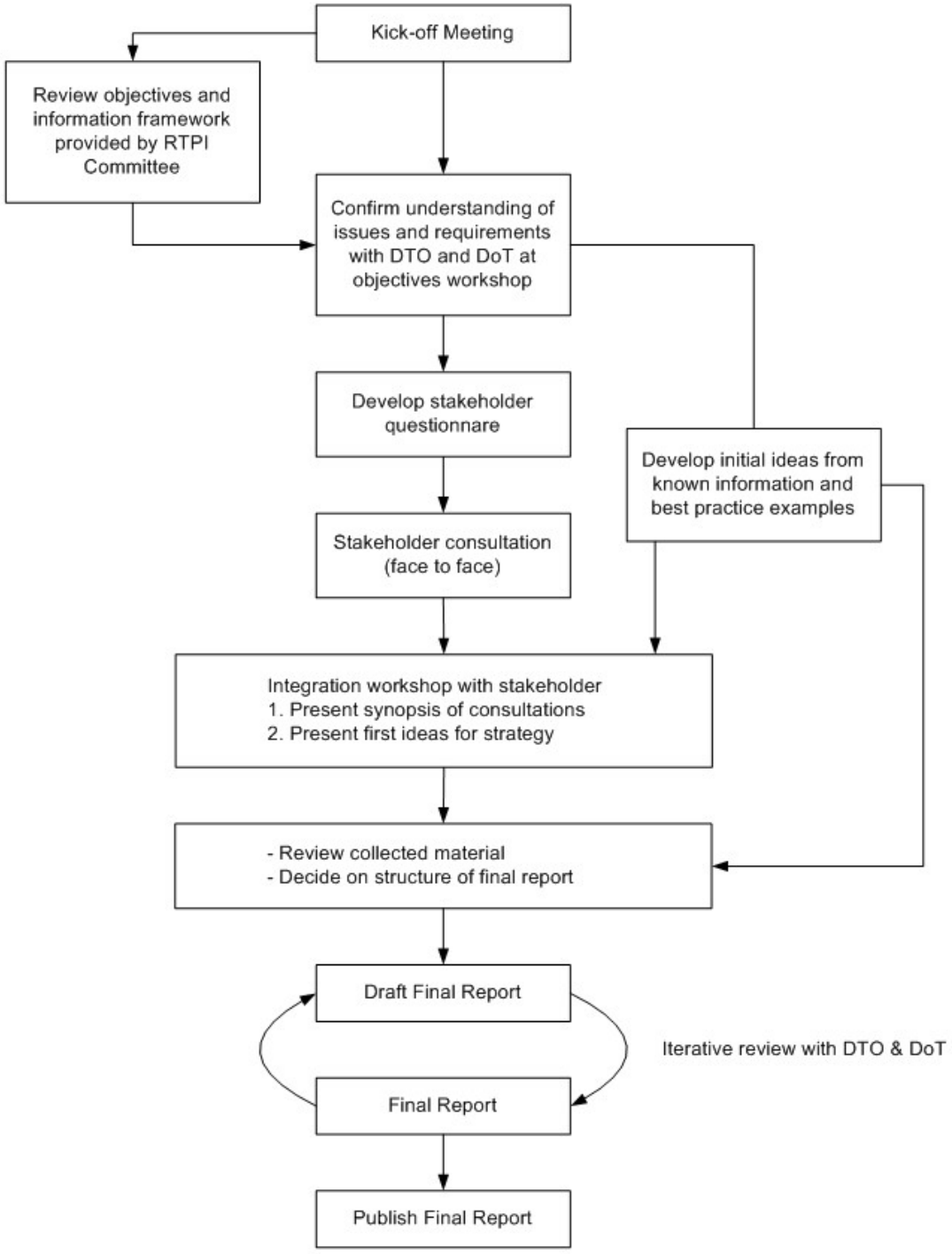


Figure 2.1 – Methodology flow chart

3. A Vision for Public Transport Information in Dublin

3.1 Introduction

A successful PTI strategy will place the needs of the citizen of, and visitor to, the GDA at the centre of any system design. The vision for PTI must be to assist:

- the planning of travel;
- the actual travelling on mode(s);
- and the guiding to a final destination

of all public transport journeys.

While ostensibly the main focus of a PTI system must be to meet the needs of public transport passengers, commitment to the effort and resources required to implement the necessary systems can be gained by meeting other stakeholders' needs. Designing a system specifically to address the needs of:

- Public transport operators;
- Regulatory Interests (incorporating transport planning requirements);
- Irish society, and
- Government

increases the motivation to resource the acquisition and maintenance of new systems and equipment. Indeed, the efficiency benefits accruing to these stakeholders are in general more quantifiable than benefits to passengers, and strengthen the case for adopting the system overall.

This chapter considers a discussion of user needs as the starting point for formulating a vision for public transport information in Dublin.

3.2 Passenger requirements for information

3.2.1 Introduction

As the passenger makes his way through a journey, from the initial decision-to-travel to the final walk to the destination, the person will want different information at different stages in various forms using diverse media. The range of media covers the "traditional" printed timetables and maps and signs, loudspeaker announcements, through to VMS (Variable Message Signs) at stops, SMS Text messages to mobile phones, and internet services to computers, kiosks, and handheld PDA devices. (Personal Digital Assistants)

The system should also be able to cater for other languages than English and Irish to address tourism and business sector needs.

3.2.2 Where is information required?

Figure 3.1 presents an illustrative but not exhaustive listing of these requirements, at what stage in the journey each is used, and differentiates between the different types of information, i.e. 'fixed' and 'real-time'. Fixed information is information on routes and timetables that describe the planned services. Information in 'real time' informs the passenger or intending passenger how the service is actually running, i.e. whether it is on time or late, or whether it will be diverted due to traffic delays or road works.

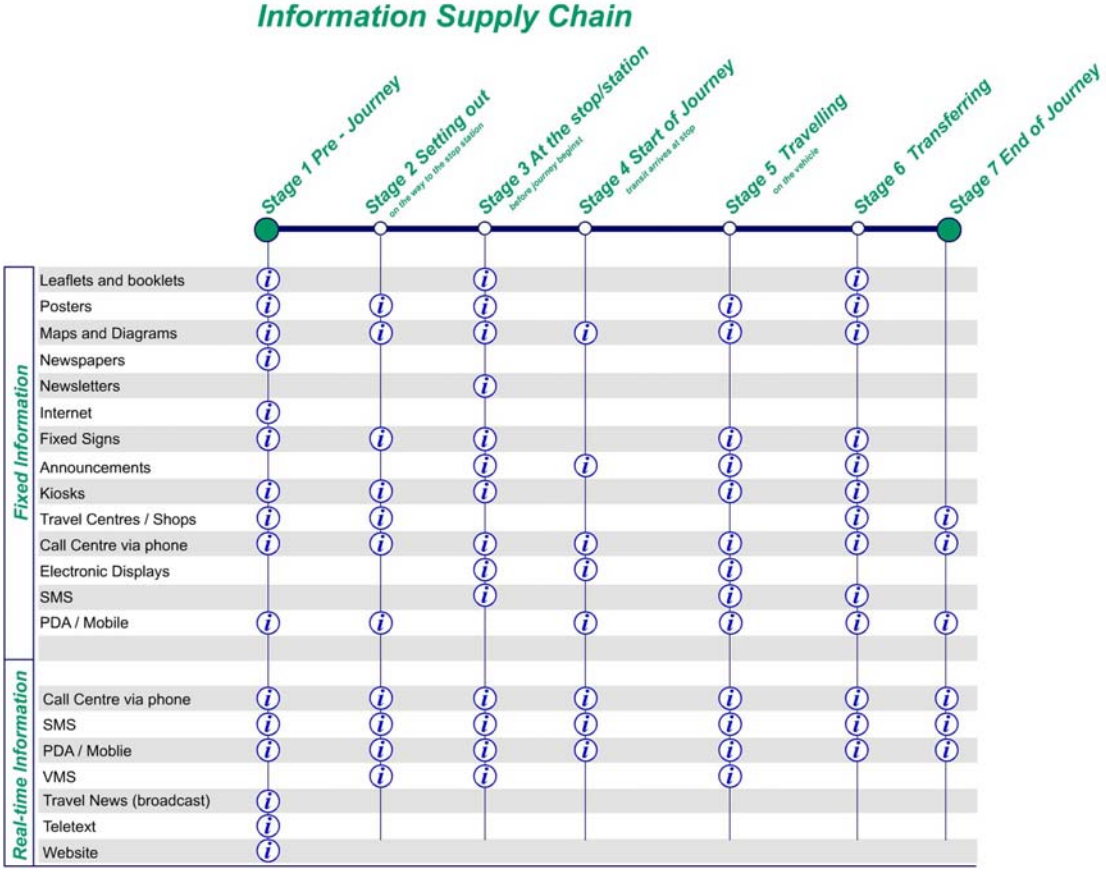


Figure 3.1 - Information requirements during a journey

It is quite likely that the public transport information needs of the resident of Naas (i.e. Hinterland GDA) will be broadly similar to the resident of Rathfarnham (i.e. Metropolitan GDA). Similar passenger needs will require similar responses of the PTI system, and this will have implications for the types of communications networks, and systems that will be required to generate data and deliver information.

There will, however, be some parts of the Hinterland Area, for example, rural areas, where the passenger needs for public transport information will be different to those for passengers in urban cores. The information needs of passenger in rural areas will be moulded by the type of service available in the area. Different needs will require different content, styles and channels of responses from the information system, and these responses may be enabled with different technologies.

3.2.3 What information is required?

Table 3.1 overleaf presents the information needs identified in Figure 3.1 in the form of typical questions that might be asked by passengers when planning travel or travelling. The reader is encouraged to pose these questions when next using his / her suburban rail station or bus stop.

Appendix D provides examples of good practice at each of these seven stages.

Table 3.1 - Typical passenger questions and required information

Typical Questions	What information is required/expected by the passenger?
STAGE 1 - Before starting the Journey	
Where do I want to go? What public transport services are available? Where is the nearest stop or station for me to catch the service? In which direction do I walk to get to the stop / station? What time is the next service *or* how frequent is it? When do I want to go? How long is the journey?	At the start of a journey the decision to make a journey by public or private transport is made. There is a requirement to provide the information needed to allow an informed decision to be made. The information required at this point includes; a journey planner, service timetables (selections from timetables), frequency tables, fare information, network maps (line maps, general schematic diagrams) Mobility and disability facilities. Provide public transport operator contact number. It is essential that the passenger receives information that is accurate, consistent and easy to understand. The information must be convenient to access and all possible media should be exploited. Information can be made available via a website, printed guides and leaflets, teletext, digital text, call centres, SMS, WAP (Personal Travel Alert Service), PDA etc…
STAGE 2 – Setting Out	
Am I going in the right direction? How much further is it? Is my service on time or are there delays?	Once the decision to make a journey by public transport has been made guidance throughout the journey must be provided. This begins with the intermediate leg that is often required to access public transport, sometimes by walking or taxi Visible on-street directional signing can be used to indicate the way to stops or stations. Public transport maps should be integrated into on-street city centre maps. Mobile phone direction and navigation services are constantly progressing and it is expected that this technology will prove useful at this stage of the journey in the near future. The passenger's mobile phone could be used to

Typical Questions	What information is required/expected by the passenger?
	provide alerts if there are problems with the service. This situation-specific service provides a personal element which helps to keep the traveller informed throughout his / her particular journey.
STAGE 3 – At the Stop/Station	

Is this the right stop or station?
How long will I have to wait?
Can I rely on the printed timetable information?
Is all the information consistent?
What are the departure times from this stop?
Is my waiting area clean and in good repair? Do I feel safe while waiting here?
	It cannot be assumed that passengers know how the services operate normally or how they are operating at present. They require information that will provide them with confidence in the services. Service information should be provided at every stop and station. It must also be assumed that many passengers may not have seen any service information before arriving at the stop station but plan to "turn up and go"
	The arrival at a bus stop or station can represent the entry onto the public transport network. The following information should be made available:
	– Operators calling at the stop
	– Stop/Station name and/or stand reference for the stop
	– Public Transport services calling at the stop/station
	– Location specific information
	  – Timetables (Departure times for each of the services)
	  – A route diagram showing the route of the service and the stopping points
	  – Fares information and methods of payment
	  – Travel information phone numbers (Operators or other enquiry number)
	  – Local area map
	  – Stop/station location guide

STAGE 4 – Start of Journey	
Is this the service I require? How much will my journey cost? How long will the journey take? How many intermediate stops are there? Is the next service the one with the shortest journey time to my destination?	As the vehicle arrives passengers need confirmation that this is the service they require. The service name and number should be displayed on the front and sides of the vehicle, and preferably the rear. It is also helpful to display all key intermediate stops. The service could be colour coded for easy recognition.

Typical Questions	What information is required/expected by the passenger?
STAGE 5 - Travelling	
Am I on the right service? Am I heading in the right direction? When do I get off? How long will my journey take? Where do I need to get off to make a connection? Is my connection on time? Will I make my connection?	Passengers require reassurance that they are on the correct service. Public announcements or in-vehicle information panels (static or dynamic) can provide information at this point. The information should include the final destination and all intermediate stops. If dynamic signs are used this information should be updated throughout the journey. Prior to each stop information on the stop name and possible transfer options should be provided to the passenger. Travelling time is an opportunity to provide additional service information. A network map should be supplied along with frequency times, fare details (season tickets), publicity of enquiry numbers, details of interchanges, customer feedback methods, perhaps even the Dublin postal areas map etc. The information must be up to date and remain consistent with all other information supplied in stages 1-4 It is also essential to keep passengers up to date if there are delays on any services. These may be supplied by their personal travel alert via SMS, public announcement or variable message signs.
STAGE 6 - Transferring	
Will I make my connection? How do I get to the next service? Do I have to pay again? Is my service on time? Are there stairs / lifts / escalators? (If transfer made on-street) Are there crossings?	Passengers must be able to find information on their connecting service quickly and easily. Ideally information displays should indicate the latest information on connecting services and which stops/platforms to use to catch the service. If it is a complicated transfer fixed direction signs should be used to minimise confusion and allow a quick connection.

Typical Questions	What information is required/expected by the passenger?
STAGE 7 – End of Journey	
How do I get to "……" Street? Where can I get a taxi? Where can I comment on the service? Where can I get information on the service I have used or for my return journey? Where can I enquire about lost property?	The passenger's journey very rarely ends at a stop or station. There is usually a last leg to reach the final destination. This can be the decisive issue in weighing up whether to use public transport – it is perceived to be more comfortable cruising around side streets in a car rather than getting lost after stepping off a bus on a main road! A local area map should be displayed at the stop or station which includes key destinations, landmark buildings and street names. Passengers often take a taxi to complete the final leg of a long distance journey. Signs directing passengers to these facilities or a taxi rank phone number should be provided.

3.3 Operator Requirements

3.3.1 Using RTPI Systems

Transport operators can be required through regulation to install automatic vehicle location (AVL) and other RTPI infrastructure on their services. However, operators generally seek real measurable improvements in cash receipt and lowering of overheads from such systems. By acting upon the result of analysis of data provided by the (AVL) technology they can achieve this through operating more cost effective services. Operators require an RTPI system that will facilitate:

- Comparison with schedule adherence and subsequent adjustment for improvement;
- Immediate response to changing situations on the ground;
- The identification, recording and quantification of the impacts of traffic congestion;
- More cost effective vehicle and staff scheduling and rostering.

Computerisation of records from a centralised GDA system in compatible formats can reduce operator office based activities, such as database input, to negligible amounts. Together with scheduling packages informed on-the-fly service insertions can be made, reducing the reliance on subjective assessments by staff. Table 3.2 shows examples of the types of analysis that can be undertaken.

On bus computer records	Potential Analysis
Ticket Machine	Before and after scenarios on timekeeping, schedule adherence
GPS[9] location track	Day / part day trends
Engine activity (dwell times, stopping times, engine management system alarms etc.)	Route / part route characteristics
Door opening and closing	Headway management
Destination blind indications	Loading

Table 3.2 – Potential Use of On-bus computer records by operators

3.3.2 Specification of RTPI

In Section 3.2 the passengers' requirements have been defined and should be reflected in the specification of any RTPI system. It will be important also to ensure that the specification of RTPI for the GDA meets operators' needs, avoids unnecessary duplication of processes, and is interoperable with other operator / regulator / local authority systems.

For example, Dublin Bus discovered that there was a gap between market offerings and their needs when purchasing the Q-Time system.[10] The complete suite of software provides everything from depot management to the production of printed timetables. However, they only required a sub set of the system, i.e. the RTPI component. The GDA RTPI system should similarly be looked upon as an add-on to operators' existing management systems.

Compatibility with Operators scheduling software

Specialist niches in the market exist, particularly for planning and scheduling software that meets operators' needs. This software can produce running board information that will tailor the use of the fleet to the demands of a service frequency, as well as produce the timetable. Dublin Bus and Bus Éireann have invested in the "Microbus" product to perform this task. Any new operators are similarly likely to have their own scheduling software, so compatibility is required from the RTPI system.

The need for full consultation with operators

With franchising now on the agenda it should be possible to conduct a consultation exercise with interested operators, existing and potential, to ensure that any specifications produced by a future GDA body will meet the future needs of operators.

[9] GPS – Global Positioning System: A "constellation" of satellites used to produce highly accurate location information using GPS receivers, originally set up for the US Department of Defense. Accuracy can be further improved to within a metre by the use of dGPS (differential GPS) techniques. See http://www.trimble.com/gps/ for a simple tutorial. The EU will launch its own Galileo system in 2008 for civilian purposes.

[10] Q-Time: RTPI system purchased by Dublin Bus in late 1990's and in use on Lucan and North Clondalkin routes

3.4 Regulatory Requirements

As mentioned in 2.1, recent policy pronouncements by Government envisage significant changes to the regulatory environment for public transport provision. The new regulatory institutions will need data and information on multi-operator public transport services. It is envisaged that the regulatory body will incorporate transport planning functions, and new PTI / RTPI enabling and enhancing technologies (i.e. vehicle tracking, fleet management software, bus priority at junctions and bus lane enforcement) will also supply information to enhance the quality of decisions in this domain.

For the Regulatory function, systems should be capable of generating information that will:

- Allow regulatory authorities to set and monitor service level agreements, franchise agreements and licence conditions on public transport performance.

For the Transport Planning function, systems should be capable of generating information that will:

- If linked with ticketing systems, allow passenger origins and destinations to be identified providing the opportunity to increase patronage by the realignment of routes to minimise walking times.
- Enable transport planners to monitor the performance of specific routes and services.
- Generate line flows on routes and services across modes aiding decision making on the appropriate level of service.
- Facilitate traffic managers in the assessment of the use of road space for public transport priority allowing them to:
  - Assess the performance of Quality Bus Corridors (QBCs) in the identification of any specific shortcomings for further improvement and to inform the design of new QBCs.
  - Provide rational public transport priority at junctions when for example vehicles are behind schedule.
  - Facilitate road and junction realignment to alleviate congestion problems.
  - Enable traffic enforcement authorities (An Garda Siochana, local authorities) to take action based on data from the RTPI system.

It is in the public interest for reasons of transparency and accountability that data on vehicle tracking should be made available to all who need it. For example data on bus movements can enhance floating car data obtained by traffic managers for journey time estimation. It is recognised, however, that some data, for example, in regard to vehicle and staff performance, and between competing operators should be considered commercially sensitive and arrangements for the secure ring fencing of this data would need to be put in place. Data formats and communication protocols used should be based on open standards to facilitate ease of data flow between different systems.

3.5 Society's Requirements

3.5.1 Recognising information

Good design to meet the needs of the elderly or disabled is good design for everyone. It is of great assistance to be able to access information in an unfamiliar location by being able to instantly recognise it, through its 'beacon' nature. Design of stops, information boards, timetables etc, therefore, should contain common features and standardised design attributes, to be found on every information display.

3.5.2 Social inclusion

It is important to recognise that not everyone feels comfortable with all modern technologies. Whilst mobile phone ownership might be high, there is a section of society that will never want to know about text messages or live WAP feeds. The telephone conversation is, therefore, the lowest common denominator that should be used for planning information services. Thus easily contactable (one number) call centres, and high quality systems within them for answering queries promptly and correctly are required.

3.5.3 Disability Legislation

Under the auspices of the Public Transport Partnership Forum, a committee comprised of representatives of CIE and of disability groups and chaired by the Department of Transport's predecessor was formed in summer 2000. The remit of the Public Transport Accessibility Committee is to devise measures to address the problems experienced by people with mobility impairment and challenges e.g. those with sensory disabilities, people with small children/luggage, etc when using public transport. The disability groups on this committee have suggested the improvement of public transport information to meet their needs as one such measure.

The Department of Justice, Equality and Law Reform is now engaged in a consultation process with relevant parties with a view to bringing forward disability legislation at some future date. While disability legislation as such does not currently exist in Ireland[11], it is clearly anticipated. Accordingly the spirit of such legislation, in recognizing and catering for people with special needs should be incorporated from the outset in the specification and design of any new PTI, including RTPI, systems that may be proposed.

3.5.4 Design of accessible information systems

Design of systems and infrastructure should be fully accessible. For IT based systems, and where static information is to be displayed, accessibility design guidelines are available from the National Disability Authority (NDA)[12]. Key amongst the recommendations is the need to include user testing at critical points of design of any information intended for the disabled, and that the needs of the elderly and those with learning disabilities are taken into account.

[11] Unlike the scenario in some other countries, e.g. US Americans with Disabilities (ADA) Act, UK Disability Discrimination Act.
[12] www.accessIT.nda.ie

Careful choice of fonts is important, to ensure readability of information by the visually impaired. The Tiresias font for use on timetables and other public transport literature and signage has been developed by the UK Royal National Institute for the Blind (RNIB)[13] specifically for ease of reading by the visually impaired.

The provision of simple additions such as hearing aid loops to aid comprehension of announcements on board, on platform, and when using customer information points should be provided.

In the UK and Czech Republic there are successful examples of the use of transmitters to activate voice announcements. Provision of similar facilities, perhaps via legislation or regulatory requirement, should be progressed in Ireland.

3.6 Complementarity with Government policy

There are a number of areas of Government policy with which any proposals on PTI, including RTPI, should ensure complementarity. The development of any strategy on PTI systems for Dublin should recognise that

- the Irish Constitution states that Irish has the status of first national language of the State;
- the goals of Government in the promotion of new technologies within the State and its public service; and
- Government policies in the area of relations with Northern Ireland.

Any proposed systems should not cut across policy in these areas.

3.6.1 Irish language issues

Foras na Gaeilge is the body responsible for the promotion of language throughout the whole island of Ireland. Its role entails facilitating and encouraging the speaking and writing of Irish. It also provides advice to Government in this area. Foras na Gaeilge has a policy to promote bilingualism, in a socially inclusive and pragmatic way. The agency has published a booklet entitled *Guidelines for Action Programmes In the State Sector.* With reference to the design of a PTI system, key language ideas that should be taken on board include:

- Dual language location naming and referencing (though not to the expense of making up translations where a common name exists) that is common to all modes and services;
- Provision of an explanatory Irish Language notice where the majority of content of a sign, brochure, website or similar is in English for space reasons;
- Irish language speaking call centre operators.

[13] http://www.tiresias.org/ is an excellent gateway to reports and links on the design of technology and its use by those with disabilities

3.6.2 Information Society

The Government is very keen for Ireland to be one of the best e-Government enabled countries in the world. The Information Society aims are being promoted by the Department of the Taoiseach and the Information Society Commission. In the second Government Action Plan *New Connections – A Strategy to realise the potential of the Information Society*, published in March 2002, the piloting of real time passenger information initiatives was highlighted for delivery by the end of 2003.

3.6.3 National / Northern Ireland Interoperability

It is recognised that people will be travelling to and from locations beyond the boundary of the Greater Dublin Area. Hence any system platforms to be developed should ideally be:

- Specified as a standard to be adopted throughout the State
- Able to extend coverage to the whole of the State either as a single system or as a network[14] of regional systems
- Compatible with similar systems deployed in Northern Ireland
- Extensible[15] to cover interurban travel between
  - Dublin and Belfast in Northern Ireland,
  - Dublin and regional cities in the rest of the State,
- Interoperable[16] with public transport platforms in the rest of the State and with Northern Ireland.

This has implications for the integrity of proposed systems and processes across jurisdictional boundaries.

It is recognised that other distinct user needs such as that associated with local or rural transport would need to be addressed if a national system for public transport information were to evolve. This is clearly beyond the remit of this study. Furthermore policy proposals for regulation of bus services originating and terminating outside the Greater Dublin Area have yet to mature.

3.7 Good practice abroad

Dubliners have travelled widely abroad, both on holidays and on business. As a result people frequently ask: 'Why aren't maps/ timetables / kiosks / journey planners, etc available in Dublin? I used them on my last trip and found it very easy to get around.' In arriving at a statement of a desirable PTI system for Dublin, it is useful to examine innovative and successful ideas that have been implemented elsewhere. It is also very useful to study the problems

[14] This is the methodology adopted in the UK
[15] The data storage capability of systems for the GDA should include a provision for storing data in a similar format for PTI & RTPI applications and services outside the GDA.
[16] In addition to data storage, there should be use of standardised electronic data interchange formats to enable search engines to query external databases. Caveats on service standards and integrity of data also need to be set out here.

experienced by others, to ensure that similar problems are avoided here during design and implementation.

Appendix D presents some examples of good practice in other cities.

3.8 A Vision Statement for PTI in GDA

A Vision Statement is often an effective way of helping organisations to understand the goals that they are striving for within an ITS Strategy (see, for example, the ITS City Pioneers ITS Toolbox[17]). Through the consultation exercise the following suggested draft Vision Statement for PTI including RTPI in the Greater Dublin Area has been developed.

VISION FOR PTI FOR DUBLIN

Information for people that will reliably tell them how, where and when they can travel in Dublin and its environs by public transport.

[17] Published by ERTICO, Copyright ITS City Pioneers Consortium

4. Assessment of current PTI / RTPI Situation

4.1 Description of Transport Systems in the GDA

The CIE Group operating subsidiaries, Dublin Bus, Iarnrod Éireann and Bus Éireann, are the dominant suppliers of public transport operations in the GDA. However, there are some smaller service providers in the market. Overall, there are eight main types of transport provider:

Mode	Coverage	Owner / operators
Intercity rail	National Rail Network with services from Connolly and Heuston Stations	Iarnrod Éireann
Suburban rail	GDA and Hinterland commuter service under DART and Arrow branding	Iarnrod Éireann
Inter urban bus	National network, small number of commuter express service into Dublin	Bus Éireann
Urban bus	Dublin metropolitan area wide comprehensive urban network.	Dublin Bus
Private licensed bus	Small number of services meeting distinct defined needs, e.g. Airport connections	Aircoach, AerDART etc.
Private bus clubs	Mainly inter-urban coach services run for their members.	Various operators
Tram	Network of lines planned, Luas on-street services. Due to begin operation early 2004	Construction funded through the Railway Procurement Agency (RPA). Connex has operating franchise for Luas
Taxi	Local Authority licensed taxi services of various fleet sizes and area coverage	Individual taxi firms. Associations promote common interests.

Table 4.1 Transport Operations in the GDA

4.2 Transport and Administrative conditions in the GDA

There are some characteristics of the GDA transport scene that have resulted in its public transport information systems comparing less favourably than those available in city-regions elsewhere in Europe (See Appendix D for examples).

(i) There is currently no politically mandated authority for information provision. In most EU countries public transport procurement and promotion in major cities is a function led by local government. Often the local authority will run or have a major shareholding in the public

transport operator as well as setting and monitoring standards of service delivery.

(ii) Local Authorities elsewhere have ownership of on-street public transport infrastructure, e.g. bus stops, and they generally have executive management of infrastructure, timetables, area-wide ticketing and service subsidies. In Dublin, there are instances of two separate bus poles, each served by a different operator, within metres of one another, with different types and styles of information presented.

(iii) The operating subsidiaries of CIE are the dominant operators of public transport within the GDA. These companies focus on delivery of services within subvention limits. As a result, PTI (including RTPI) systems are in general a desire but not an objective. The setting up of information systems within and between the constituent companies is an even lower priority and information on non CIE- group services is not generally considered.

(iv) The effect of growing congestion levels on the reliability of bus operations has made it difficult for bus companies to produce route timetables with confidence. The information presented at any bus stop is the time the bus leaves its terminus or the frequency of the service. The investment to comprehensively address the issue of accurately and reliably locating buses, and estimating their time of arrival at each stop on their route, has not yet been made.

There is increasing diversity in public transport provision. The Minister's statement proposes to abolish CIE and replace Dublin Bus, Bus Éireann and Irish Rail as independent commercial state companies with strong commercially focussed boards. The Minister's statement anticipates that up to 25% of the market for bus services in the GDA will be franchised in 2004. The Luas franchise, under Connex, is scheduled to commence operations in the same year. A number of newly licensed private bus operators have commenced operations within the last few years. Transport operators are reluctant to provide information in public transport services other than their own. There is a need for increased policy and direction regarding integration of public transport services in Dublin.

4.3 Current and future planned PTI and RTPI provision

During consultation, the current level of PTI and RTPI provision in the GDA has been ascertained, and individual planned projects have been discussed with the consultees. (See Appendix E)

4.3.1 What do we have today?

With regard to PTI, timetables are provided by public transport operators, but in general for ***their*** passengers only. They generally own the stop infrastructure, and for bus stops there is a local authority / Garda Siochana approval process for siting them.

The inconsistency of information presented is apparent. Dublin Bus timetables on carousels at stops generally only provide the departure times from the origin of the service, though they do give an outline of the route. Occasionally there is fare information. The stops (either basic bus poles or

bus shelters) themselves do not adequately reflect the "Quality" of many of the Quality Bus Corridors where the operating environment and service provision has been enhanced. Maps and interchange information is scant or non-existent. There has not been, however, any significant enhancement of PTI, and RTPI has been present only in the '*Q-Time'* trial system operated by Dublin Bus.

At Heuston and Connolly stations, and at Busaras interurban coach terminus, the situation is better. There is a good level of information, staff are generally available to answer queries and electronic arrival and departure information is also provided. DART operates an RTPI system. However at rail stations there is inconsistency of information between electronic displays, automated public address systems and manned public address announcements which can lead to passenger confusion. There is no information presented at interchange stations regarding bus connections to destinations out of walking range.

It is notable that recently the independent operator Aircoach has been able to make a business case for introducing automatic vehicle location technology to assist the management of their operation.

4.3.2 What is planned at the moment?

- A national integrated ticketing system with initial deployment in Dublin is planned. Should such a system require AVL technology with a need for data communications between "back office" and vehicles then there is potential for infrastructure savings with RTPI. Integrated ticketing and fares systems are relevant to PTI but do not have a direct impact on service information. Progress on ticketing projects should not impact on the roll-out of RTPI.
- The Luas project has defined high quality PTI and RTPI as a component of its service
- Within the CIE Group little is planned. However:
  - Dublin Bus has indicated that they have applied for NDP Funding for RTPI, which may be an extension or parallel system to the existing Q-Time system they regard as a pilot implementation.
  - Bus Éireann has a web based journey planner in place;
  - Iarnrod Éireann plan to make improvements in information provision as part of general track and service upgrading and enhancement projects. But, problems of interoperability between existing IE systems and moving towards a multi-modal based information provision ethic remain to be addressed.
- Aircoach will be implementing WAP and web based RTPI in the near future.

INSTANT and STREETWISE projects

The INSTANT[18] and STREETWISE[19] EU sponsored ITS (Intelligent Transport Systems) projects led by the National Roads Authority both contain activities

[18] http://www.nra.ie/Transportation/IntelligentTransportationSystems/INSTANT/
[19] http://www.streetwise-info.org/

that include public transport information. There are clear synergies between these projects and the PTI /RTPI Strategy.

In the INSTANT project there is a focus on the dissemination of multi-modal information for the Dublin Belfast corridor including a pre-trip planning tool. A journey planning web site including timetable and real time information is being proposed. The exchange of data between authorities and operators is also being examined as part of the project. In STREETWISE the standardisation of data exchange at a European level is being considered which would include real time information on travel services.

PTI and RTPI in Northern Ireland

In Northern Ireland the public transport body Translink is to implement a new journey planning system which will improve the quality of timetable information provided by call centres and web sites to allow national journey planning facilities. Their web site[20] provides a constantly updated travel news service.

The Roads Service in conjunction with Translink is implementing RTPI in Belfast with a view to expanding the system across Northern Ireland. Consideration is being made of the implications for cross border services.

4.3.3 Strengths and Weaknesses of Current and Planned PTI/RTPI projects

The Stakeholder consultations helped to identify the strengths and weaknesses of the current and planned PTI/RTPI projects as follows:

Strengths	Weaknesses
Many of the required building blocks are in place, and can be built on in any future scenario. There is a substantial body of practical expertise and experience. Most players understand the key challenges of integration (services, information, systems) and of customer support Many players can see clear linkages between the provision of good information and business generation There is generally a willingness to co-operate There are many new delivery channels waiting to be exploited Working Iarnrod Éireann Systems exist	There is no clear policy, nor are there standards for PTI/RTPI The Stakeholders act individually in the absence of co-ordination There is a lack of consistency in style, messages, and content Information often does not meet the actual customer need Bus stop information is insufficient for the user The network is confusing, and lacks a clear map There is a lack of an end-to-end journey planner There is no obvious way to exploit PDA's and mobile phones There is a lack of real-time information The primary bus operator does not have

[20] http://www.translink.co.uk/

	the platform to support real-time information There is incompleteness, non-harmonisation and discontinuity of databases Iarnrod Éireann Systems do not have the desired degree of interoperability No lead agency to encourage joint initiatives (e.g. communications networks) that would benefit all. Communications solutions unique to operators are being pursued, potentially limiting future interoperability with other operators systems, or leading to bespoke rather than "open" standardised implementation.

Table 4.2 - Strengths and Weaknesses of Current & Planned PTI/RTPI Projects

4.4 Summary of the gap between the Current Situation and the Vision

The gap between what the GDA has now, and what is planned for the future, and what the Vision encompasses is clear.

Key gaps are

- Lack of location specific timetables for any urban bus stop other than at a terminus;
- Variable quality of information provision;
- Lack of agreed location reference data on the position of stops;
- Incompatibility between existing databases in terms of language and formats;
- PTI and RTPI is currently developing in an uncoordinated way across modes and operators;
- No journey planners;
- No map information at points in the network
- No standards have been set.
- No integrated, multi-modal/multi-operator provision of public transport information in Dublin

Unlike every other location examined for good practice examples in Appendix D, and examples of organisational frameworks elsewhere in Europe in Appendix F, the GDA does not have a formal established institution that can take the lead in this area. Clarity of purpose has now been obtained from the Minister of Transport in his statement of 7 November, 2002 to the Public Transport Partnership Forum. The duties of this body, the precise details of which have yet to be published, are expected to include all public transport issues over and above the provision of PTI. However, the development of good quality PTI should not have to await the crystallisation of these institutional changes. In the short term, co-operative arrangements may be

necessary, notwithstanding the views expressed in the consultation, along with some thought and effort in design and specification, and some resources can be harnessed to bring about a high quality PTI, including RTPI, system.

Atkins has found, during its consultation exercise, considerable support for this view amongst existing players in the sector, as the following Table 4.3 shows.

	View Expressed	Implication for the Strategy
1	There is general agreement of a need to change and improve the quality of all PT information available to the passenger	Do nothing is not an option. Waiting until regulatory and institutional change is made is also not preferred.
2	Large amounts of data (e.g. stop locations, detailed timetables) either need checking or do not exist and/or have no nominated "owner"	An organisation needs to be nominated to manage the data, the collection of new data, and the processes associated with keeping the data up to date.
3	Current regulatory / institutional framework is not the best arrangement for implementing the change	Any implementation strategy is likely to begin as a "co-operative" venture and must seek to minimise the potential conflicts
4	Through CIE Group, the DTO and RPA, the State effectively owns much of the existing PTI infrastructure, process and systems that can be built upon.	Either through change of organisational responsibility, or by the imposition of guidelines that make the assets "non-competitive" under the general ownership of the State (DoT), removing potential barriers / mistrust
5	There is no current method or channels for monitoring the level and quality of PTI and RTPI provision.	Any new organisation be it a QUANGO, or department of an existing entity must have a charter defining the level of service it will deliver so that it can be independently monitored
6	Operators wish to retain their right to manage their own publicity.	Any new organisation should have a clear remit on what publicity it will produce. Any relevant information pertaining to a particular operator that could be used for publicity purposes should be available to that operator

Table 4.3 - View Expressed in Consultation Exercise and Implications for Strategy Formulation

5. Realising the vision

5.1 Introduction

Thus far, the study has established that the quality of existing PTI, augmented by the implementation of current plans for its development, does not achieve the Vision for PTI set out in Section 3.8. Therefore, if fully integrated, comprehensive PTI, including RTPI, in Dublin, is desired, intervention is required. This chapter sets out to explain in general terms how this should be done.

There are three main considerations:

(i) The programming and methodology to be adopted;

(ii) The Infrastructure including IT systems to be put in place

(iii) The organisational management

5.2 Programming and Methodology

5.2.1 General

PTI and RTPI to meet the vision will not appear overnight. There are a whole series of stages to be gone through. Some involve very small considerations (e.g. ensuring that there is a power supply at a bus stop for an RTPI indicator) and some large (e.g. all parties being able to confidently reference every bus stop). There are also economic and commercial considerations such as regulatory change, franchising of services and the introduction of integrated ticketing that will be occurring at the same time.

Cooperation must be the watchword. Stakeholders know that change is required. They should play their part in helping to catalyse the step-change that is required.

5.2.2 The CODE Seven Step plan

The programme and methodology for the change can use the benefit of experience, as outlined in the CODE Seven Step Plan for implementing RTPI.

In 2000 a group of experts commissioned by the EC's CODE project reported on best practice for the provision of bus based RTPI[21]. In an extensive report they looked at examples from Scandinavia, Spain, France and the Q Time system bought by Dublin Bus. Their conclusions were clear and identify seven steps to successful RTPI provision:

1) Improve static timetable quality
   - On street and call centre

[21] Guidelines for Implementing Real-Time Information Projects for City Wide Public Transport – CODE Task Force, June 2000.
http://www.cordis.lu/telematics/tap_transport/library/code_real_time_info.html

2) Equip fleet with tracking devices
3) Implement radio links for RTPI data from bus to depot
4) Monitor operations in real time
   - On bus, to driver, to manager
5) Real Time on-street
6) Real time away from stop (e.g. to phone)
7) Integrate with fares and booking

Consecutive completion of each step should lead to overall successful deployment. However, initiation of each step does *not* have to be consecutive. Overall it is strongly recommended that the seven step approach is a main principle of the GDA PTI/RTPI Strategy.

5.3 Proposed Approach

What follows is a non-technical overview of the scale and scope of the recommended intervention.

5.3.1 A lead agency

It is recommended that through the auspices of the DoT and managed by a Committee a new co-ordinating entity, the PTI Office be established. Its main responsibility would be to neutrally administer and develop the proposed PTI, including RTPI, system. The roles and responsibilities of such an entity will be discussed in more detail in Chapter 7, but mainly comprise being a clearing-house for the processing of data that is not commercially sensitive on public transport routes, services and timetables, eventually in real time, and presenting the information it produces in easily accessible ways to the public. Ultimately this role will be subsumed into the proposed regulatory body.

5.3.2 Operators

All licensed and franchised public transport operators in the GDA will supply data on routes, services and timetables to the co-ordinating entity, in a specified format and language. Eventually, when this data is available in real time, operators will be able to access whatever historic data on their own operations they may require. This will permit operators to refine their operations to achieve efficiencies in many cost areas. Commercially sensitive information will not be made available to competitors.

5.3.3 Infrastructure

In the multi-operator operating environment envisaged in the Ministerial statement of November, 2002, ownership and exclusive use of bus stops by individual operators is inappropriate. There is a requirement to identify the fixed infrastructure of the bus network, e.g. bus stops, interchanges and bus priority schemes and differentiate that from the services serving that stop. A regulatory authority with local authorities acting as agents should in the long term become the “owner” of bus stops. The locations of the c. 5,500 bus stops within the GDA must be accurately located and recorded in a database. Similarly, locations of the many ‘points of interest’ that cause numbers of

people to travel to and from them should also be pinpointed in a formatted database, and planning authorities should provide updates to these as land use circumstances change over time.

5.3.4 Passengers

Passengers will, quite simply, know more about the network of public transport services, and will be kept informed of its development. They will know what choices are available to travel, how much it will cost in advance of setting out, the reasons for delays and how long they will be at each stage, how and where to change service, even if this changes mid-journey., If targets on modal share are to be achieved, more people will be required to use public transport, so they have to be able to get to know about it. The strategy while meeting operator and regulatory interests will have the passenger as its focal point.

5.3.5 Regulatory Matters

The generation, storage and processing of data on the real time movement of vehicles should:

- limit the need for extensive surveys of public transport operations
- contribute to the planning and regulation of a modern public transport system
- deliver a more cost effective public transport service providing better "value for money"

Eventually, when information is generated and channelled to passengers in real time, local authorities will be provided with bus performance data that can be used for traffic management and bus priority scheme design.

5.3.6 Finance

There may be some scope to involve the private sector in the outsourcing of certain identifiable tasks within the proposed strategy, or in the provision and maintenance of certain types of equipment. This will be further discussed in Chapter 7.

5.4 Be Prepared!

The recommended strategy requires commitment from existing players in the sector to ensure its success. If this is not forthcoming from the outset, there is no point in starting. Flawed, out-of-date information eventually becomes misinformation. While the scale of what is proposed is significant, the predicted benefits will also be significant. Benefits to passengers, operators and planning agencies will be discussed in more detail in Chapter 8.

It is important that decision makers realise early that what is proposed in this report is not a once-off decision / action. The decision to provide information, especially in real time, across a conurbation the size of Dublin, incorporating all its modes of transport, requires an **on-going** commitment to

- Maintain equipment, e.g. displays, kiosks, shelters, etc at stations, tram stops and bus stops / shelters, at hospitals, shopping centres, and busy city centre 'info points';
- Update route / service / timetable data, following planned service level changes occasioned by planning decisions, changes of franchise conditions / holders, commercial decisions, etc.
- Develop and initiate a call centre, informed by a journey planner, to answer queries for information
- Update the computer based location records of places of interest and access points to public transport, such as bus/tram stops and rail stations, reflecting changes caused by planning decisions, temporary road works, the provision of new roads and new walk links, the implementation of new cycle links, etc. so that any web-based journey planner is up-to-date.

6. System Architecture for GDA PTI and RTPI

6.1 Introduction

Chapter 5 pointed out that technical and organisational proposals would be made to progress the provision of PTI in Dublin. This section outlines the necessary system architecture, or set of technological elements, of the recommended strategy.

6.2 What is a System Architecture?

A system architecture is needed when a number of 'systems' are required to work together so that their output as a unit is better than / different to anything each could produce individually. The individual component systems, or 'building blocks' are harnessed together, and the channels of communication between them are compatible, such that data flows unhindered between the components. The architecture will provide a stable basis for a working and workable system for the provision of the PTI, including RTPI for the GDA.

6.2.1 System Overview

Figure 6.1 provides an outline of the proposed architecture that will result in integrated comprehensive PTI, including RTPI. Elements include:

- Databases, in which data on accommodating the data requirements of the PTI & RTPI service are held;
- Passenger information delivery systems;
- Automatic vehicle location systems;
- A means of controlling and managing the data associated with the strategy (the "PT Information Engine");
- Delivery channels by which the PTI services can be accessed and obtained.

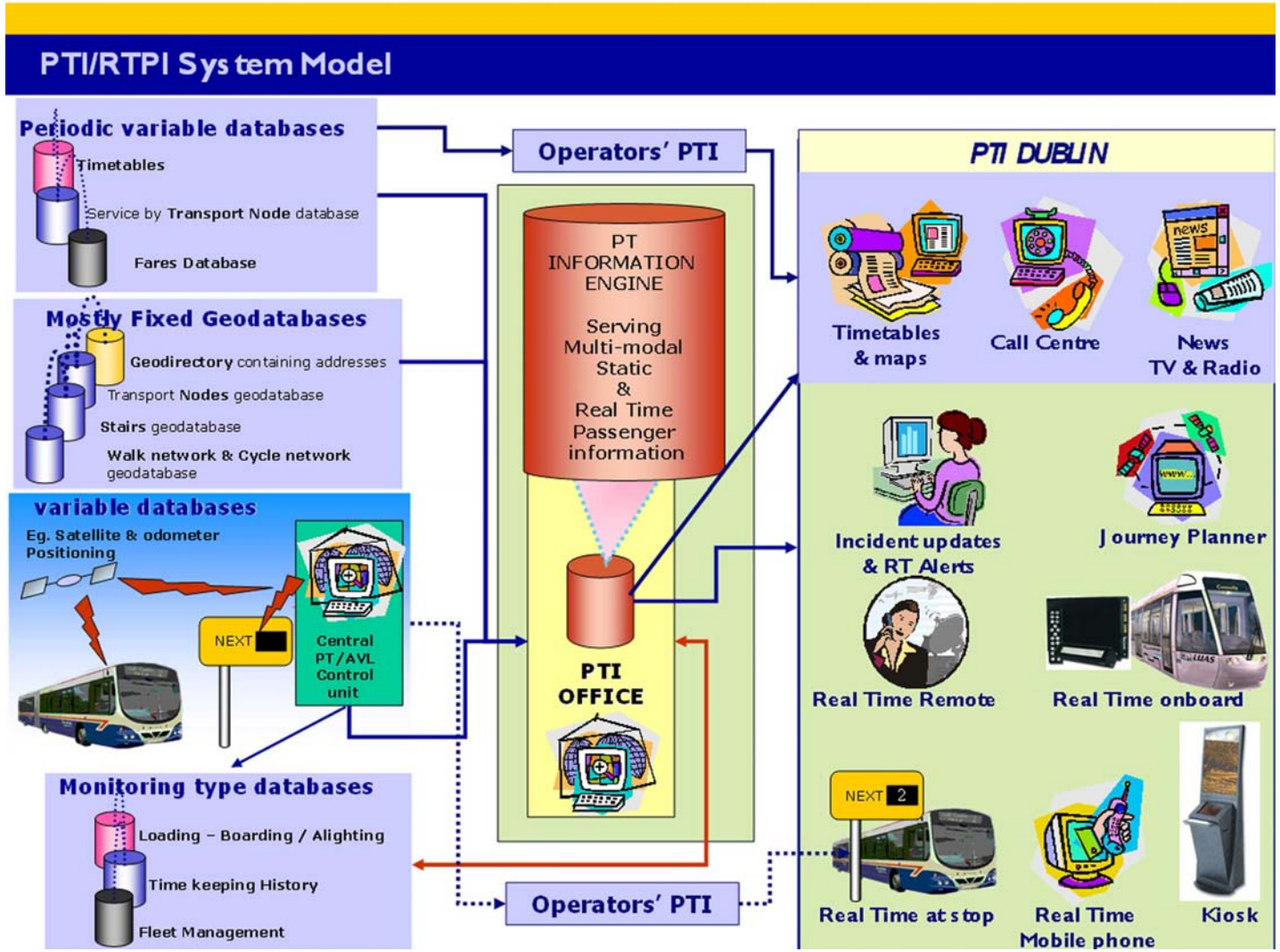


Figure 6.1 – PTI and RTPI System Architecture concept

6.3 Individual components of the System

6.3.1 Introduction

There are many individual elements to the overarching system, grouped into the following categories:

- Inputs – i.e. databases
- Outputs – i.e. products on different media
- Interfaces
- Communications Links

Effective integrated PTI, including RTPI, relies on the production of high quality service timetables. Throughout the proposed system architecture, and certainly with the advent of real time information, synchronisation of clocks will be essential. This should be achieved by the specification and use of atomic clock signal receivers within system servers. GPS location satellites all use atomic clocks to maintain the accuracy of their broadcast signals[22].

6.3.2 Inputs

A database is a collection of data that is organised so that its contents can be easily accessed, managed and updated. Databases will either export information or allow on-line interrogation within the system architecture. The type of database used is much less important that the ability to efficiently query the database to extract items of data.

A variety of data needs to be brought together (aggregated) to drive most PTI applications (e.g. Journey Planners). This will be carried out within a "Consolidated Data Factory" owned and operated by the PTI Office.

The main database components of the PTI/RTPI system architecture are:

- Fixed Geo-databases[23], containing the co-ordinates in space of all the 'points of interest' generating demand for travel within the conurbation, and also the co-ordinates of rail stations
- Periodic Variable Databases[24], containing the co-ordinates in spaces of bus and tram stops, and the stopping patterns for each service in the network. These are called 'periodic variable' because changes in service design can cause the chains of stops served by different services to change over time.
- Real Time Databases, containing the constantly updating locations of all vehicles in the public transport fleets.

[22] See http://www.npl.co.uk/time/msf.html for details of the MSF atomic clock signal, GPS signals carry a clock signal derived from their own atomic clocks.

[23] Examples include: The An Post / Ordnance Survey of Ireland GeoDirectory. This accurately locates the precise geographic location (X, Y co-ordinates) and the exact postal address for every home and business in Ireland.

[24] Examples includes: UK NaPTAN bus stop location referencing system

6.3.3 Outputs

Traditional products running the full gamut of PTI will be produced, such as 'serving this stop' timetable lists, network maps, location maps, etc. Products such as 'next bus / train' displays at stops / stations will be produced with the advent of RTPI. These will be published on a variety of media. These media will be categorised as follows:

- Supplied by the passenger – e.g. mobile / WAP phones, PDA's, etc. The concept of being able to send an SMS message to query a timetable for the next three services or arrival times of a certain route number at a particular stop will be available. Contact advice should be made available at every stop.
- Supplied by the co-ordinating entity – e.g. kiosks, at stops displays, journey planners

A major element of the strategy will be to develop comprehensive and easy to understand mapping information for use on printed timetables, at stop information carriers (including posters) and web sites. A common look and feel should be developed including the following:

- Geographic maps of the area around a stop that includes other PT stops and points of interest;
- Fare information and fare zones (if applicable);
- Diagrammatic and geographic representations of routes serving that stop and other stops on the route;
- A diagrammatic representation of the core GDA public transport network: Quality Bus Network; Luas and Metro; DART and ARROW and any planned new mode;
- Area/county/suburb diagrammatic maps.

A considerable body of work must be carried out to specify requirements in this area. The key factors that will influence the specification of equipment types will be their intended location.

6.3.4 Interfaces

A number of links have been identified in order to integrate the various components of the system architecture, the most important of which are:

- Data exchange between systems (and databases);
- Enquiries between systems (i.e. information queries).

If data is not consolidated as part of the architecture, then the seamless integration of existing systems is usually necessary, in order for each to co-exist and thus to deliver the strategy. Within this strategy the requirement to procure new systems but honour legacy systems will be a balance between the seamless journey planning and RTPI functionality provided by the PTI Office, and the disparate information from other sources.

Data Exchange

The exchange of data from one database to another is an important aspect of the strategy. Protocols have been developed to enable data to be exchanged electronically between different databases and data owners.

Using Internet technology, it is possible for client applications to access to select and retrieve data servers of suppliers without the need to install specific software via the World Wide Web.

Data exchange comes in two forms, on-line and off-line exchange. Off-line exchange corresponds to processes which have a degree of human intervention i.e. not automatic as opposed to on-line which relates to a full automated process.

For the on-line exchange of information, a distinction between structured and unstructured exchange needs to be made. Most information systems have an Internet presence, which allows the exchange of information between system and user. Although they use worldwide standards, this exchange is tailored for human use and is not very machine-friendly.

A more structured interface based on XML (Extensible Mark-up Language) is available on some systems, but is not widespread or standardised. The XML based exchange mechanism would be more suited given that data is structured and easily interpreted by machines.

The adoption of standards is important to ensure that efficient mechanisms exist for exchange of data into databases (from other databases or other sources), and for allowing the interoperation of components (systems). Standards need to be considered primarily for the exchange of data. A limited number of formal standards are in use, although many de-facto and proprietary standards exist, for example, through TransXchange[25], Transmodel[26] and ATCO-CIF[27].

In order for data to be easily exchanged; standards can support this but are not essential. A growing number of projects (e.g. TRIDENT[28] and JourneyWeb[29]) are focusing on the standardisation of data exchange interfaces, which is intended to enable the transfer of information between heterogeneous systems.

[25] An XML-based standard to allow for the exchange of bus registration and timetable information electronically.
[26] Standard which addresses the data dictionary and data modelling requirements of public transport operations, this covers a number of modes of public transport (bus, tram, and metro).
[27] Association of Transport Co-ordinating Officers-Common Interface File - is a data exchange protocol that essentially provides a general purpose interchange format for common elements of timetable information.
[28] EU Project developing mechanisms for the sharing and exchange of common data to enable and support multi-modal services.
[29] A protocol to allow Journey Planners to communicate with each other in order to answer a user's query.

6.4 Communications

Within the RTPI strategy the main communications requirement is for a radio network to be used to poll public transport vehicles to discover where they are, and to communicate with vehicles via text messages (voice is not a requirement for RTPI), on street displays, kiosks and hand held operator/PTI Office terminals.

The data to be handled by this network will be large numbers of short bursts (e.g. I am the No 19 bus, 15:00 departure from O'Connell Street, and my location is <HERE>). A solution is required that will ensure radio coverage at all times across the urban public transport network to facilitate polling of all vehicles at least every 30 seconds if required.

In much of the rural hinterland journey times between stops are longer. An exception reporting or confirmation polling regime would be a more suitable solution. This would only identify that a bus was late / on time at a particular stop and subsequent stops. Connectivity would only be required at defined points.

The requirement strongly suggests a packet data network as the solution. These can be implemented on a variety of bearer technologies, analogue and digital. Instant connection ("always on" provision) and easy scope for future expansion is needed

6.4.1 The Technical Options

There are four technical options:

- To use an analogue PMR (Private Mobile Radio) system. Dublin Bus has a PMR system provided mainly for voice communications (though it is understood that Q -Time data also has a channel)
- Use a digital Mobile Data Network
- Use GPRS (General Packet Radio Service – an "always on" digital service being rolled out by mobile phone companies)
- Use TETRA (Terrestrial Trunked Radio) – a digital closed network service

Analogue solutions are "old" technology, have often been originally designed as voice systems but are usually reliable. However, there is a limited and diminishing supplier base. Bus companies like PMR because it is relatively cheap to set up and license and running costs are considered low.

Digital systems are newer, with major manufacturers like Motorola strongly supporting take up. Digital data is accurate; reliability of decoding is generally excellent.

Mobile Data Networks are commonly used as a business solution to transmit data to and from mobile personnel, a typical sector being the freight industry. Channels do not mix data with voice telephony. Costs are based on the amount of data. Services are usually bought from a reseller. Mobile Data is not a common bearer for RTPI as the costs are often high in comparison to other solutions for the small data messages sent.

GPRS (2.5G) is intrinsically an internet protocol (IP) system working over GSM mobile phone circuits. It is suitable for packet data streams as required by RTPI. Some slight delays due to the need to set up a session on every broadcast, occasional drop out, and competition for network space from other data and voice services can reduce service reliability. Services can be bought "by the byte" from service providers, and through re-sellers giving bulk discounts.

TETRA is regarded by many as the next generation digital PMR solution for voice and data. It is a digital, open standard, IP based service offering high reliability and security supported by a large supplier base. Key markets are emergency services and increasingly, public transport operations. TETRA can be implemented as public or private networks. It meets all the requirements for RTPI and has been selected by the RPA for the Luas communications. However, the network would have to be constructed.

3G services, the next generation of mobile telephony may well be a suitable bearer for RTPI, certainly for public facing information systems. However as yet they have not begun to be rolled out in Ireland.

6.4.2 Key issues

Network coverage is the biggest issue. By 2012 a single PTI Office controlled network should be the goal. This will mean instances of several systems being used in the interim. This is achievable by ensuring the modems attached to the on-bus computers have multiple ports and are intelligent enough to select the network appropriate to the location.

It is essential that the robustness of the communications to on-street devices is proven, and responsibility for failure to communicate resulting in incorrect information being displayed is pre-determined.

Short term decisions on technology should be avoided. There may be a case for longer partnership reselling of services say over 7, 10 or 15 years to support the growth of RTPI.

The Commission for Communications Regulation may wish to encourage use of a certain technology or spectrum.

Finally, and possibly most importantly, a radio network may be put in place for the integrated ticketing project. Synergy between two major investments centred on public transport both needing similar communications provision should be encouraged.

6.4.3 Scope for partnership or revenue earning

Procurement of communications may be through one of three models:

a) Straightforward capital investment in a private network;

b) Straightforward purchase of capacity from network operator or through a reseller on a monthly (or similar) basis;

c) Partnership approach.

The reseller approach may have advantages in that a bundle of services appropriate to the requirement might be procured.

There is scope for a longer term partnership to develop and maintain data communications for RTPI. Issues that may interest potential partners are:

- Revenue from integrated ticketing communications provision should the integrated ticketing system require similar communications to RTPI
- Revenue from rental of voice channels to public transport companies
- Development of value added services
- Expansion in to other sectors
- Provision of radio solutions as a preferred partner to other ITS applications / services / sectors / clients in Ireland

6.4.4 Next Steps – Implications for Public Funding of Telecommunications Networks for Public Transport

As has been seen in 6.4.1 there are several options for radio telecommunications solutions for RTPI. If decisions are left to the operators they are likely to decide on the best solution for their needs based upon:

- Voice and data requirements
- Analogue v digital technology maturity / risk
- Capital and revenue budgets (outright purchase v contracted service)
- Current ownership of assets (e.g. radio towers)
- Degree to which they can sub-contract maintenance

Little or no synergy with other operators or modes is achieved, and potential economies of scale and cost saving are missed.

The provision of RTPI provides an opportunity to consider the benefits or otherwise of single, all modes and operators common communications platform. This would be under the ambit of a central authority and potentially for all public transport needs. A similar approach is being taken by Government Departments[30] with responsibility for emergency service operations, who are considering pooling resources for a capital intensive public sector radio network.

It is recommended that a communications study should be undertaken to:

- Fully examine existing and proposed systems with a view to obtaining value for money for both the exchequer and operators.
- Recommend the appropriate technical approach(es) to be taken
- Recommend the most cost effective long term telecommunications approach for RTPI.

[30] An emergency services committee incorporating representatives from the Department of Finance, the Department of Justice, Equality & Law Reform, the Department of Environment & Local Government and the Department of Health and Children along with An Garda Siochana is looking at the potential of a common nationwide radio network for police, fire and ambulance services.

- Recommend the most appropriate procurement method.

6.5 Techniques for automatic vehicle location

Techniques for tracking vehicles within closed systems, such as railways have existed for some time. When a train or a tram passes a particular point (signal, station etc.) this is recorded within a system. A similar concept has been demonstrated in bus location systems where a bus communicates via a transponder to a beacon mounted at a stop or on a lamppost to report its position. An advantage of these systems is that with fixed reporting points fixed communications infrastructure, often cabled, can be used. However, in an "open system", such as a network of bus routes that is subject to change, the RTPI that is possible is only as good as the beacon network available. Thus the majority (if not all) of the RTPI systems suitable for a large conurbation like the GDA use GPS location of some sort.

GPS (Global Positioning Satellite) technology overcomes this problem by accurately locating vehicles to within metres. A radio communications infrastructure is required to support AVL using GPS. GPS location can be augmented by other systems (e.g. odometer on bus, beacons on street, additional triangulation signals)

Major investment is planned in implementing Integrated Ticketing in the GDA. Figure 6.2 shows the potential location equipment / processor and the communications for both systems. Clearly it would be best if only one set of common equipment is specified.

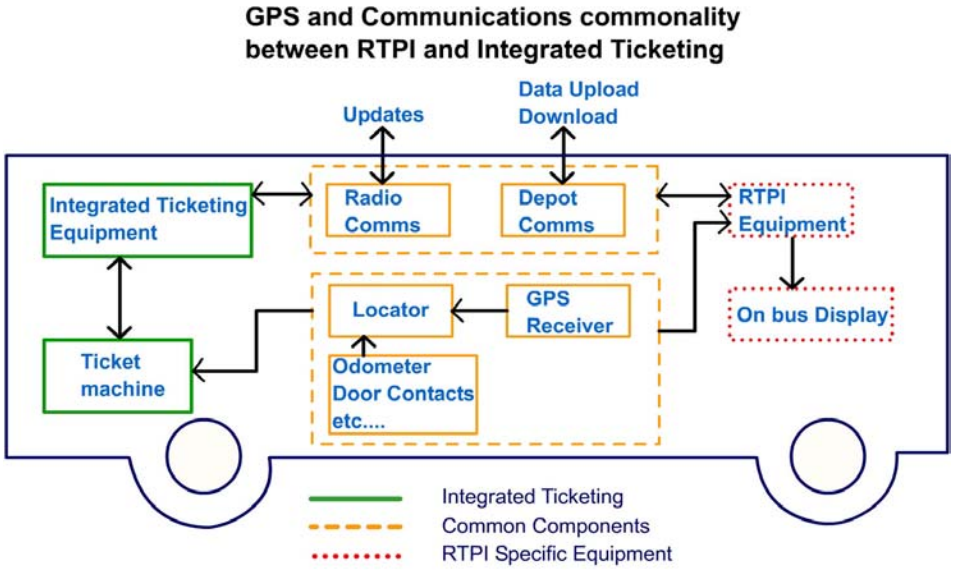


Figure 6.2 – Common on bus components RTPI and Integrated Ticketing

6.6 Benefits of a System Architecture

The system architecture will provide a stable basis for the deployment of the recommended strategy throughout the GDA. Adherence to this architecture will provide benefits to all stakeholders, in particular:

- Passengers – who will experience the output from such a system, i.e. integrated, comprehensive information on public transport services within and to the Greater Dublin Area.
- Authorities – who will see the benefit of a robust approach, providing confidence in their long term aspirations and investments in the strategy;
- Suppliers – who see the benefit of a stable approach and the use of common standards removing technological boundaries that may exist within it.

Effective deployment and use of the system architecture requires new business relationships to be established. Chapter 7 outlines recommendations in this area.

7. The PTI, including RTPI, Business Architecture

7.1 Introduction

As stated in Chapter 6, the benefits of new technological systems will not be realised without associated changes in roles and responsibilities of players operating within the system architecture. This section sets out the key concepts and changes that must be pursued within the business environment of the public transport sector.

7.2 What is a Business Architecture?

In essence, a business architecture describes the roles, responsibilities and relationships that should exist amongst and between agencies, which are trying to work together to achieve a common aim. What is proposed here is purely an organisational arrangement and not a formal statutory structure. Also, as stated previously, these proposals are intended to apply before the onset of, and ultimately migrate to, the regulator's office.

A key indicator of success of business architectural initiatives is whether passengers perceive the PTI service for Dublin to be delivered by a single organisation, or not. The business architecture is mainly about clearly defining responsibilities for which elements / tasks, where new systems and processes are required, and how they are to be maintained. The organisations through which spending will be directed are identified. Benefits for all - passenger, operator, and regulator should ensue.

7.3 Elements of the proposed Business Architecture

The business architecture concept for PTI and RTPI in the GDA has three strands:

- The establishment of a PTI Office, with responsibility for collecting data, publishing information and setting standards for PTI for the GDA;
- The development and marketing of a public transport "brand" common to all modes and operators that the public can identify with, trust and rely upon;
- The development of a set of agreements and processes governing agency participation in PTI in GDA.

The business architecture will need top level political support to be successful and to encourage "buy in" by the stakeholders. It will be a purely organisational arrangement and not statutory. Formalisation of the processes involved and the consolidation of the arrangement in the long term should be part of the overall regulatory and institutional changes made in time by the DoT. The business architecture proposal is about identifying the channels through which investment should be made and the mechanisms required for successful delivery at the organisational level.

7.3.1 The PTI Office

The strategy sees the formal establishment of a PTI Office to drive the strategy forward in an executive capacity. It will be a fund holder, able to award contracts; second staff, procure consultants and contractors as appropriate, manage infrastructure and handle the devolving of responsibility to local authorities and transport operators in the cause of delivering the strategy. In the longer term it will be subsumed into the new regulatory body for public transport.

In the period before the establishment of the regulatory body, the PTI Office will require a PTI Management Committee to steer it. The membership of the PTI Management Committee will be drawn from stakeholders, regulators, authorities and interest groups, including DTO, DoT and Local Authorities. The membership should be kept small, but with the ability to accept representations from smaller stakeholders. The PTI Management Committee should also be tasked with providing the DoT with an annual assessment of the performance of the PTI Office.

To maximise its flexibility to deliver the strategy the PTI Office should be allowed to sign framework agreements for staff secondment, consultancy support, and pilot project development for software specification development and data acquisition exercises. Under these framework agreements set rates and costs would be used for tasks within agreed budgetary limits. Framework agreements should be for 2 years, with extensions by agreement.

Options for establishing the PTI Office

While the potential to establish a PTI Office using a public private partnership approach (PPP) should be explored, inherent contract complexity and risk would appear to rule out swift appointment of a totally private sector contract to deliver on the entire PTI strategy.

When considering the reporting lines for the PTI Office, the existing precedent of appointing a lead local authority (as in the case of the QBN Project Office) was considered. However, the migration path to the future scenario of a regulator is likely to be easier if the PTI Office was established independently.

This leaves the options of nominating either DTO (strategy bias), RPA (delivery bias) or DoT (policy bias) to take the initiative. However, as stated earlier, it is considered that the PTI Office would best be established as an independent entity reporting to a PTI Management Committee as shown in Figure 7.1.

The PTI Management Committee would be advised by passenger, operator and agency advisory panels, which would then advise the Regulator following establishment of that function. The agency advisory panel would incorporate those organisations or bodies who have an interest in public transport but are neither passenger nor operator (e.g. Aer Rianta).

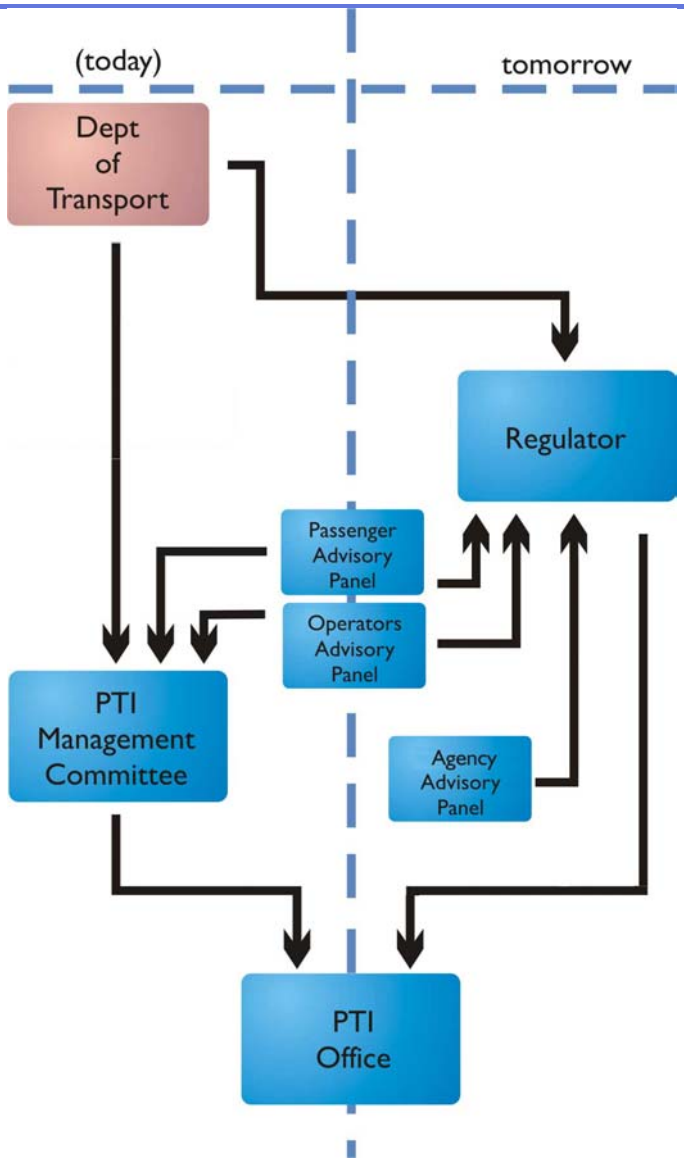


Figure 7.1 – PTI Office reporting lines, short and long term

The PTI Office will:

- Own, champion and manage the use of the "PTI Brand" brand
- Have an initial remit of creating the agreements to deliver the PTI/RTPI strategy;
  - With operators
  - With Local Authorities
  - Other agencies (RPA, DTO, DoT, Aer Rianta, ports etc)
- Be the owner for the new assets that will be created or purchased;
- Consult with other Agencies, local authorities, advisory panels as appropriate
- Appoint contractors to deliver components;
- Appoint consultants, software developers to research and pilot projects;
- Be directed by the PTI Management Committee.

7.3.2 The PTI Brand

Every example of good practice that the study has considered has involved the strong presence of a top level brand. Variously in Europe this extends to regulatory functions, operations and supervisory management. From the London Transport roundel to the simple initials of Berlin's BVG the brand tells the customer "Here is public transport". With that message generally comes a natural understanding that high quality accurate information (and a gateway to more detailed information) is provided, *and* a one stop entry point to make complaints, trace lost property, make suggestions etc. is available.

The brand, its logo, the typefaces and colours it uses will all reinforce the change in the level of provision of PTI. It should not be launched until there is a step change in the information available.

It is essential the brand is regarded as being additional to operator identities. The way the NDP logo is used is an example of how the overarching brand logo and name can be used. It will be common to all services and modes, a mark of quality intended to add value to other identities. It cannot usurp existing brands in the multi-operator environment.

Brand ownership and championing must reside with the PTI Office. It should be able to issue permits to allow others to use devices associated with the brand as long as it has a final veto. It is likely that initially the brand will be designed (possibly through an agency) and managed by the PTI Office with branded information being produced by operators using existing systems. In this way personnel who understand public transport marketing in the GDA will be involved. As part of the overall regulatory changes a migration path to PTI Office becoming the sole publisher of core branded information should be identified.

The brand as a source of integrated information should be exploited through media partnerships. It should not be seen as a major source of income however. For instance where there is a branded internet journey planner module this could be used as content on other web sites by agreement for free. The important thing is that the brand is seen as a new dawn for the availability of PTI which the public can relate to improved service provision, and be confident about using modes advertised using the brand.

7.4 Agreements

To ensure that stakeholders and other interested parties clearly understand their role and responsibilities and the processes in which they are to participate, a number of agreements with the PTI Office are necessary. Table 7.1 outlines the scope of expected agreements.

Agreement	Concept
Data ownership	The PTI Office will be the owner of several key reference databases, e.g. stop location, RTPI operational data. It will need to source data, e.g. timetable schedules maintained by operators. Third parties may wish to use data, and this must be subject to formal agreement.
Data maintenance	It is important to establish rules and responsibilities for the updating of data to be provided as part of the system, whoever is the owner.
Nomenclature (Data definition)	The PTI Office will be responsible for publishing details of the naming conventions and rules to be adopted by itself and the data providers. Agreement on this nomenclature, the data library supporting it and commitment to its use will be required
Ownership of data generators	Data will be owned by different entities. There is an important distinction to be made between the publishers of processed data (which is likely to be the PTI Office) and the generators of the data which may be operators. The operator may be using their own equipment or kit issued by the PTI Office. To avoid the potential for dispute formal agreement on ownership of the data generators and their constituent parts will be required.
Data Quality	The PTI/RTPI system will only be as good as the data that drives it. Quality service levels should be set for all data within the system
Data Management Guidelines	Within the commitments to provide information to the PTI Office there is a need for agreement on the use and management of the data. A key example is information about different operators, which should be secure and unable to be shared in a way that might give commercial advantage.
Infrastructure Guidelines	Part of the PTI strategy is geared to ensuring that sources and positioning of publicly accessible information are similar wherever the individual is within the GDA. There are two main requirements: a) The legal process for locating bus stops and the PTI Office being notified of locations and intentions to locate. b) Common agreement on a “Boarding Point Guidelines” manual for the implementation of infrastructure including meeting accessibility and Irish Language rules
Information Guidelines	Within Appendix D there are examples of good practice for printed timetables and RTPI. Clear and unambiguous display is required, and stakeholders must be involved in determining any agreed format.
Service Levels	Whilst many of the above agreements are intra-organisational in nature, the Service Levels are seen as the promises that will be made to the public at large on what the Strategy will deliver.

Table 7.1 – Agreements required

7.4.1 Actions required

A series of actions and functions underpin the success of implementing a Public Transport Information and Real Time Passenger Information Strategy (PTI & RTPI) for the GDA, i.e. data will need to be managed, information will need to adhere to specific rules, any street furniture will comply with best practice and a predefined level of service will provide customer satisfaction.

Figure 6.1 illustrates how data and information could be handled to maintain up to date PTI provision. The proposal allows operators to maintain existing systems but requires them to upload information to the PTI Office or its representative. In a "PT Information Engine" the PTI Office will aggregate all available information and data for the purposes of driving an integrated journey planner. This would have the capability of generating:

- Departure boards for any PT stop within the GDA
- Timetables for any single route
- Timetables for specific multi stage / multi mode journeys
- Individual journey queries to call centres, internet sites, kiosks etc.
- Data for use by SMS at stop queries

Development of the system would at a later date include a fare query engine to match the timetable query capabilities.

For RTPI, the system control would lie with the PTI Office. The PT Information Engine would be the source of the base timetable data to be used by the RTPI. As the RTPI reported in positions further upgrade of the journey planner would allow real time updates, something that may open up a revenue stream from queries from mobile devices, e.g. inspectors and agents with PDA type terminals people at stops with mobile phones.

8. Overall Strategy Costs, Benefits and Programming

8.1 Introduction

The overall estimated capital cost for implementing the strategy is €36.9m. The spend will be divided between direct public investment through the PTI Office and local authorities, contributions from operators, and PPP type arrangements. Almost half of the costs are on dissemination of real time information through displays and telecoms services. To put the investment in context, the provision of PTI and RTPI should be considered as part of the mechanism by which the modal shift goals outlined in *A Platform for Change* is to be achieved. Ongoing running costs of around 10% of the total estimated scheme capital cost per year should be expected to be shared between operators and the PTI Office.

Within this chapter the spending on the strategy is shown as beginning in 2003, which is considered as Year 1 of the programme. Clearly, given the publication date of this report, special arrangements will be necessary to allocate seed capital from the exchequer during 2003.

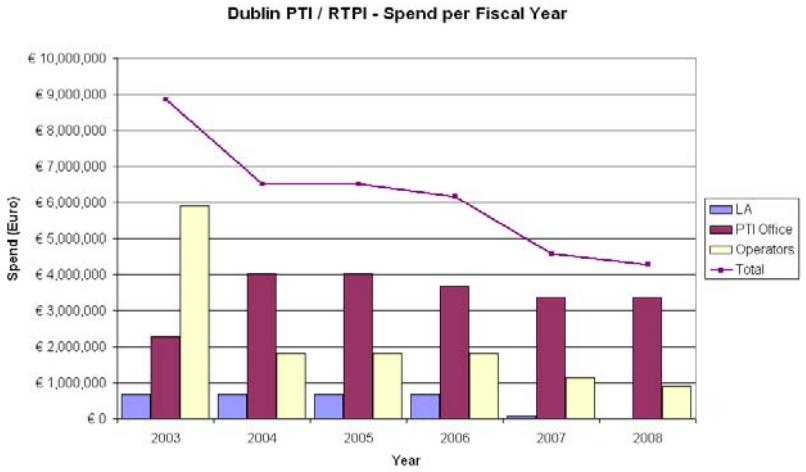
8.2 Costing Summary

The cost for the PTI/RTPI implementations and deployments are identified below under the general headings that they can be grouped under. Each of these groups provides a beneficial service to the traveller to supply them with information to assist their journey on public transport.

The costs of implementation for the various initiatives are summarised in Figure 8.1 within the table of costs and the deployment duration. The organisation accountable for each initiative cost is captured as well. The miscellaneous implementations in 'Initiative 1' are described in more detail later in this chapter.

The following sub-sections provide details in a commonly structured way. First a brief general description of the implementation proposed giving unit costs, overall benefits and beneficiaries, and issues to be resolved is given. Then any requirements for implementation of the works are listed, followed by the tasks which can be undertaken once the work is completed. Finally a table of key facts: costs; duration; funding sources; and key benefits are given.

Initiative	Organisation Accountable for Cost				Deployment Duration					
	LA	PTI Office	Operators	Total cost per Initiative	2003	2004	2005	2006	2007	2008
1 (A-K) - Miscellaneous Implementation - Combined	€ 0	€ 1,700,000	€ 0	€ 1,700,000						
1 (I) - Miscellaneous Implementation - Consultancy	€ 0	€ 500,000	€ 0	€ 500,000						
2 - Bus Pole Replacement Programme	€ 2,350,000	€ 150,000	€ 0	€ 2,500,000						
3 - Bus Tracking	€ 0	€ 1,100,000	€ 2,700,000	€ 3,800,000						
4 - Traffic Signal Priority	€ 400,000	€ 0	€ 1,200,000	€ 1,600,000						
5 - Rail and Tram Implementations	€ 0	€ 100,000	€ 5,000,000	€ 5,100,000						
6 - On-street and interchange Bus RTPI	€ 0	€ 16,842,000	€ 0	€ 16,842,000						
7 - On-vehicle Displays	€ 0	€ 0	€ 4,500,000	€ 4,500,000						
8 - Telecommunications based PTI and RTPI	€ 0	€ 360,000	€ 0	€ 360,000						
Organisation Totals	€ 2,750,000	€ 20,752,000	€ 13,400,000							
			Project Total	€ 36,902,000						



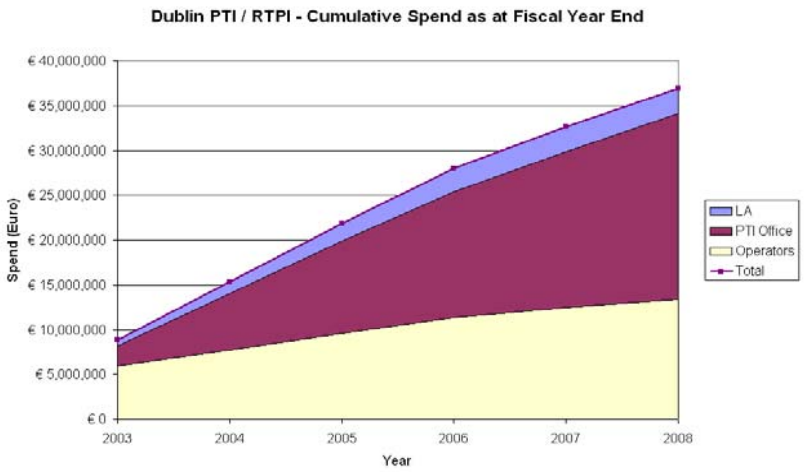


Figure 8.1 – Spend profiles for the Strategy

8.3 Benefits from AVL

While operators receive no measurable benefits from the provision of on street RTPI displays they are interested in real measurable improvements in cash receipts and the lowering of overheads. AVL can contribute to the operator's bottom line.

The real benefits to operators come from deploying AVL as part of RTPI through:

- The analysis of the records stored in the on bus computer
- Better information on bus such as automatic next stop announcements improving passenger readiness to alight and reducing stop times.
- Added value through connection to in house back office systems.
- Easy electronic production of information for regulators
- Easy electronic assimilation of information from regulators
- Identification of congestion, black spots and the quantification of their impact on bus operations
- Active traffic signal priority
- Enabling "verifiable in court" bus lane enforcement
- Improved understanding of the network conditions and development of best practice and consequent informed input into future network design.
- Reduction in voice communication with drivers through use of text messages to on bus control panel.

8.4 External Factors

For the most part the capital spending programme should be independent of any external factors. In many cases it will be a case of assigning responsibility to the PTI Office, its local authority agents, operators and asking them to deliver. However, consideration must be made of certain external factors which may alter programmes and spend profiles:

- The DoT is intending to restructure the way public transport is provided:
  - Franchising of GDA urban services – up to 25% of the bus network from 2004 is proposed;
  - An integrated ticketing system is to be introduced;
  - Consideration is also being given to the future regulatory arrangements for bus markets outside the GDA.
- Rail based modes are subject to much more stringent safety case assessments than road based modes.
- Provision of GDA wide radio systems will be subject to:
  - Possible dual use requirement with Integrated ticketing
  - Possible commercial pressure from manufacturers and system resellers to adopt particular solutions;
  - Influence from the Commission for Communications Regulation to use certain parts of the frequency spectrum;

  - Pressure to use legacy radio systems
  - Cost and extent of radio coverage
- Private Sector considerations will have to be taken into account if:
  - Operators requirements are to be met as part of PPP (e.g. Luas) or franchised agreements
  - Contracted (e.g. journey planners, call centres) or value added services (premium personalised information) require early or guaranteed dates from the public sector to be able to go live without incurring financial loss

Dublin Bus will also be an important partner in the many of the initial data gathering and verification processes. In some cases investment by the bus operator will be a requirement, and, for instance, until a franchise is awarded any existing operators may be reluctant to risk such an investment. Good and structured management of the migration process will be required to minimise the effects on the PTI and RTPI programme.

8.5 Cost assumptions statement

The costs used to produce the estimates are based on figures supplied to Atkins in confidence by manufacturers, local authorities, and from information derived from RTPI and PTI tender exercises in which the company has been involved in the UK.

8.6 Initiative 1: Miscellaneous Implementation

8.6.1 Introduction

There are a number of activities that must be undertaken through the auspices of the PTI Office, and with the exception of item L, all during the first year of operation (2003), with an over cost estimate of €2.2m.

8.6.2 General Description

	Activity	Cost notes	Cost Estimate (€)
A	NaPTAN location and coding of all stops in GDA	6000 stops @ €30 per stop (assumes growth as network grows from current total of approx 5500)	180,000
B	Creation of Brand Identity	Production of agreed brand identity and usage guidelines	200,000
C	Web and Call Centre Journey Planning Software for the GDA	Based on system cost for typical similar systems in UK	500,000
D	Single phone number call centre set up		150,000
E	Branded Website	Does not include functionality of Item C - Journey planner	50,000
F	Irish Language Charter		20,000
G	Boarding Point Guidelines	Production of Manual	100,000
H	PTI Office Set up	Annual running cost of €400k not included	200,000
I	Rail Legacy Systems Study	To assess scope of spend required	100,000
J	Communications Study	To recommend a strategy for communications for RTPI in the GDA	100,000
K	Sources of Funding Study	To examine public and private sector options funding in detail	100,000
L	Secondment, framework Consultancy and contractor support	Spend spread over three years	500,000
		Total	**2,200,000**

Table 8.1 –Miscellaneous PTI Office works

8.6.3 Requirement for implementation:

- Agreement of strategy
- Item B (Branding) is a pre-requisite for items C to G

8.6.4 Pre-requisite for:

- Roll out of services

8.7 Initiative 2: Bus Pole Replacement Programme

8.7.1 General Description

Bus pole replacement provides the ability to present a 'uniform identity' of the public transport system and also enables ownership of the stops by or for the PTI Office.

Provision of the bus pole is to be a local authority responsibility as agents of the PTI Office[31]; poles will no longer be unique to individual operators. At every public transport stop (not only bus) a PTI Office branded pole and information case/carousel is to be provided. In many cases (approx 3,500) a simple re-labelling will suffice at €100 per stop, but it is expected that a significant minority of sites (approx 2000) will justify new poles at €1,000 a stop.

A contingency of €150,000 has been included to cater for planning, liaison, unusual situations.

Shelter ownership is outside this programme. Shelter provision contracts will need to be transferred from operators to the local authority or PTI Office. It is assumed that provision of shelters will remain as a capital neutral item through contract(s) with shelter providers (e.g. Adshel, JCDecaux) who gain from the advertising revenue. The terms of the contract for shelter provision should permit the PTI Office to specify maps and timetables to be displayed at each one.

8.7.2 Requirement for implementation:

- Local Authorities as agents of the PTI Office assuming all responsibilities for bus stop location and street furniture other than shelters, but specifying information content at shelters
- NaPTAN survey of stops to provide full scope of task

8.7.3 Pre-requisite for:

- Incorporating RTPI within the flag on a bus pole

8.7.4 Key Facts:

Total Cost:	€ 2,500,000
Duration of implementation:	4 years (2003-6)
Annual Cost of implementation:	€ 625,500
Primary funding:	PTI Office / Local Authority
Secondary funding option:	Partnership agreement with street furniture provider?
Key benefit:	Quality infrastructure in known locations branded for PTI Office, not operators.

[31] Depending on legislation this may transfer to the Regulator in the longer term.

8.8 Initiative 3: Bus Tracking

8.8.1 General Description

Bus tracking provides the "real timetable" aspect of tracking the vehicles and providing efficiency for the service operations. This work feeds into the display of information at bus stops and is required to gain true RTPI at the stops. Operators can gain benefits from the use of tracked data to improve the service they provide to the passenger and to their operational cost base.

The majority of the cost is incurred in the 1,200 on-bus units at € 3,000 per unit. These costs should be borne by the operators as a franchise obligation to install, maintain and operate a GPS tracking system. Costs for central computing and provision of secure data reporting should be borne by the PTI Office (10 service analysis software and terminals at €20k each).

However, franchising of services is not due until late 2004. Therefore it is proposed that 300 units are purchased to be used by Dublin Bus and other licensed urban operators to provide more accurate timetables of the entire GDA urban network based on a sample of a quarter of the fleet. If franchising slips the programme will slip.

Costs for equipping Inter-urban bus and coach services serving the GDA have not been included.

8.8.2 Requirement for implementation:

- Programme for implementation based on franchising timetable
- Operator co-operation

8.8.3 Pre-requisite for:

- At stop real-time RTPI, On-street Bus RTPI, Traffic Signal Priority, and Telecommunications based RTPI

8.8.4 Key Facts:

Total Cost:	€ 3,800,000
Duration of implementation:	4 years (2003-6)
Annual Cost of implementation:	Year 1 - €1.1m (all public sector) Subsequent years €900k per year (all private sector)
Primary funding:	Operators (€2.7m) PTI Office (€1.1m)
Secondary funding option:	none
Key benefit:	Increased operational efficiency and improved timetables

8.9 Initiative 4: Traffic Signal Priority

8.9.1 General Description

Traffic signal priority works on many levels in that it improves journey times and provides the ability to "catch up" on lost trip time. There is the secondary psychological effect of "the bus is beating the car" at signalised intersections – assisting in the mode shift decision towards public transport.

While this initiative does not directly contribute to the provision of PTI / RTPI, the enabling systems have the added functionality of providing priority for buses at traffic signals.

The majority of the cost is two fold in the 1,200 on-bus units at € 1,000 per unit to be borne by the operators and 100 units within signal controllers at € 4,000 per unit to be borne by the local authority.

Potential trial / early implementation is possible on the Lucan corridor using Dublin Bus Q-Time equipment, and on the Airport-City-Airport route using the Aircoach tracking system.

8.9.2 Requirement for implementation:

- System deployment is on the basis of AVL capability being provided.

8.9.3 Pre-requisite for:

- None

8.9.4 Key Facts:

Total Cost:	€ 1,600,000
Duration of implementation:	5 years (2003-7)
Annual Cost of implementation:	Year 1 -€ 100k, Years 2 to 5 €375k
Primary funding:	Operators €1.2m Local Authorities €400k
Secondary funding option:	None
Key benefit:	Improved journey times for PT

8.10 Initiative 5: PTI Implementation on Rail and Tram systems

8.10.1 General Description

Suburban Rail has a good record in providing PTI and RTPI. However, there are a number of challenges that need to be addressed including:

- making suburban rail information an integrated part of a multimodal information environment
- extending and improving existing systems such as the DART RTPI
- Integration of data sources within Iarnrod Éireann

For light rail is expected that Luas will have a high standard of PTI and RTPI provision. However, how this as a closed system might key into an integrated system for transport information is not clear. Furthermore, there are issues concerning how information about future Luas and Metro systems will be accommodated.

A Rail PTI and RTPI Feasibility Study to be undertaken in 2003 costing €100k is proposed to define the rail projects that need advancing. A provisional sum of €5m has been identified for implementation of these projects.

8.10.2 Requirement for implementation:

- Completion and acceptance of recommendations of the Feasibility Study
- Iarnrod Éireann and Luas will be responsible for these implementations under the direction of the PTI Office.

8.10.3 Pre-requisite for:

- The Feasibility Study is a pre-requisite for design and implementation.

8.10.4 Key Facts:

Total Cost:	€ 5,100,000
Duration of implementation:	4 years (2003-6)
Annual Cost of implementation:	Study (Year 1) €100k €5m provisional estimate for implementation
Primary funding:	Study funding from PTI Office, implementation costs from operators
Secondary funding option:	None
Key benefit:	Improvement of existing systems

8.11 Initiative 6: RTPI on street and at interchanges

8.11.1 General Description

This provides the traveller with live information at their stop. It affirms the service frequency for the user and in the event of a delay – communicates to the user the length of wait. This provides the traveller with a focus for their travel information needs.

The focus of interchange RTPI at interchanges is to provide ease of information on multi-modal travel rather than limiting the traveller choice by focussing on a specific mode. This promotes the network identity of the public transport system.

It is recommended that the PTI Office would fund the provision of at stop displays. On street information has no value to the operator and they would not be expected to contribute to the cost of indicators.

On street equipment does provide an opportunity to source secondary contribution from system suppliers if they are regarded as partners rather than contractors. Better standards of signing, the use of more advanced technology and a commitment to meeting the local (rather than generic market) user needs should result.[32] This has clearly been the case in Gothenburg, Sweden where Volvo has been closely involved in the successful GOTIC project to provide RTPI over many years.

At Stop

RTPI indicators usually have built in intelligence so that they can operate in timetable mode even when unable to pick up radio communications. Pole mounted or built into a shelter they are around €10,000 per unit. If 1,500 stops are equipped this would cost €15m.

At Interchange points

Further sums of €800k and €600k have been identified for 40 ruggedised monitors and 20 plasma screen displays respectively for use at key interchange points. 20 Kiosk information points at €22k each will cost €440k. Total cost for interchange points of €1.84m.

Clearly design work to identify the most appropriate sites, equipment types and implementation plans is required, but the quantities priced only amount to 25% of the stops in the GDA to be equipped by 2009.

8.11.2 Requirement for implementation:

- System deployment is on the basis of regular and accurate location reporting capability provided by bus tracking via radio communications to a control centre.

[32] [Note, given the intelligence at each display unit, low cost passenger information units enabling timetable fare and connection queries as well as real time information could be an alternative technology solution that a system partner could propose]

8.11.3 Pre-requisite for:

- None, display of RTPI is at the end of the information chain. Systems that provide the data to drive on-street indicators can be used for other real time services (see Initiative 8)

8.11.4 Key Facts:

Total Cost:	€ 16,840,000
Duration of implementation:	5 years (2004-8)
Annual Cost of implementation:	Averaged as € 3,368,000
Primary funding:	PTI Office
Secondary funding option:	None
Key benefit:	Focussed information for the traveller and tenure of patronage

8.12 Initiative 7: On-vehicle Displays

8.12.1 General Description

On-vehicle Displays provide information about the service they are travelling on. The displays are cheaper than RTPI on street units, and if just used to advise of next stop and adherence to schedule they do not require radio systems.

Two types of display have been costed in 1,000 LED type displays at € 2,000 and 1,000 TFT displays at € 2,500. There will be indicators for upstairs and downstairs saloons and the front and back portions of articulated buses.

Funding will be by the operator and should be included as a franchise requirement.

8.12.2 Requirement for implementation:

- System deployment is on the basis of on board bus tracking unit being fitted

8.12.3 Pre-requisite for:

- Real time connection information provision.

8.12.4 Key Facts:

Total Cost:	€ 4,500,000
Duration of implementation:	5 years (2004-8)
Annual Cost of implementation:	€ 900,000
Primary funding:	Operator
Secondary funding option:	
Key benefit:	Timely information for passengers while travelling on service provided

8.13 Initiative 8: Telecommunications based PTI and RTPI

8.13.1 General Description

Telecommunications based RTPI is inclusive of all modern methods of providing information to the traveller including the Internet, WAP, SMS, and Call Centres. The high tech access to information provides a supplement to traditional paper timetables and the extra functionality of real-time information to the traveller.

The use of telecoms, in particular the mobile phone, as a medium of delivery is much cheaper than providing at stop displays. Moreover, there is a charging mechanism which can either be used to subsidise on going revenue costs or even provide a positive revenue stream.

8.13.2 Requirement for implementation:

- Fixed time data will be on the basis of timetable data that is collected in a standard format.
- Real-time functionality for the system deployment is on the basis of the availability of real time data from the AVL tracking systems

8.13.3 Pre-requisite for:

- Possible value added personalised services

8.13.4 Key Facts:

Total Cost:	€ 360,000
Duration of implementation:	2 years (2004-5)
Annual Cost of implementation:	€ 180,000
Primary funding:	PTI Office and DoT
Secondary funding option:	NDP
Key benefit:	Remote and real-time access to information for the traveller

9. Sources of Potential Funding

9.1 Private sector investment

To roll out the PTI and RTPI strategy will require a large investment from the public purse. However, as shown in the cost estimates in the previous chapter there is clear identification of private sector contribution, particularly from operators, which can be enforced through franchise agreements. The potential for partnering arrangements to secure further contribution – generally via a price reduction for a guaranteed length of contract is also highlighted.

There are also other mechanisms that can be put in place to involve the private sector and hence reduce the cost to the public sector. There may be the possibility to transfer capital spend to revenue over a set period, where the opportunity to commercially exploit a component of the strategy exists:

- Telecommunications – through using a contract for RTPI (and possibly integrated ticketing) to set up a network with more channels / capacity than required by RTPI, and then selling on the spare bandwidth to others;
- Street furniture – bus shelters are already maintained by Adshel through an agreement with Dublin Bus that is self financing through advertising revenue. There is scope for continuation and expansion of this arrangement in future – though additional advertising sites may need to be part of the deal;
- Call centres – through level of service agreements with call centre operators who provide other services from their call centres;
- Value added services - where telecoms operators (perhaps who are providing RTPI communications) or mobile services (e.g. ring tone sellers) feel there is a gap in the market they can fill using PT information;
- Sponsorship – visible advertising for a key brand partner throughout the network in return for capital contribution

9.2 European Commission

On 4 July 2001 the EC published a recommendation "on the development of a legal and business framework for participation of the private sector in deploying telematics-based Traffic and Travel Information (TTI) services in Europe".[33] The document is advocating a commonsense approach to making data available, managing interfaces and using common standards. It makes recommendations for

- the facilitation of European TTI services;
- regulatory framework for TTI services;
- proprietary traffic and travel data;
- observance of road infrastructure hierarchies and traffic management strategies; and

[33] 2001/551/EC

- facilitating TTI services.

It also invites Member States to report progress to the Commission in establishing the appropriate national framework for participation of the private sector in TTI services within two years.

9.3 The potential for PPP

The use of Public Private Partnerships (PPP) is seen by the Government as a useful instrument in accelerating the progress of major investment that would normally come from the public purse. In return for a long term franchise the private sector partner will take on some of the risk and provide the up front capital investment.

For PTI and RTPI there is a possibility for introducing PPP. The result could be innovation and successful exploitation of provision. However there are two key questions:

- How acceptable politically is it for a private contractor to be effectively in control of what could be regarded as public information?
- How confident private sector partners can be that all potential barriers, legacy agreements, operator intransigence can be overcome?

One of the biggest issues to be resolved before a PPP can take place is to identify the scale of the investment required and the measurement(s) by which the private partner will be judged and hence paid. Whilst costs can be relatively easily calculated the economics behind setting the measurement parameters is not. This is especially more so in this situation where base data simply does not exist at the present time.

The conclusions therefore are that:

a) PPP should be a clear possibility in four to five years when the initial systems and deployment are in place, and regulatory reform has been made. At this point it should be possible to quantify expansion, replacement and enhancement requirements[34].

b) For the initial phase, partnership agreements are suggested. These would be with suppliers, system developers; consultants, research institutions, business organisations (e.g. the Dublin City Business Association) and operators. Reassured by guaranteed continual involvement, these stakeholders will act in the interest of the public project, and possibly through exploitation or economies of scale to leverage small cost savings over the duration of the partnership.[35]

[34] A comparison could be made here with the PPP to replace the ticketing system on the London Underground. A system existed with known characteristics and quantities that needed replacing, and LU elected to enter into a partnership with the Prestige consortium to design build and maintain a new, much enhanced system.

[35] A comparison could be made with the partnership arrangement Dublin City Council have with Tyco and the Elmore Group for traffic signal provision.

9.4 Potential for recovery of costs through the farebox

One source of raising revenue to recover costs already incurred in implementing this strategy could be to consider a levy of farebox revenue once tangible improvements are obvious to all.

As an example, if over 5 years an average of 210,000 public transport journeys per day are made, and 10 cents from every fare is taken for PTI and RTPI, €38.325m will be raised. On-going running costs, expansion and replacement programmes could also be funded in this way.

However, the concept of farebox levies requires further study and this is recommended.

10. Study Conclusions

10.1 Introduction

Quality, accurate and reliable public transport information is a basic requirement of passengers. In Dublin, the public transport network is being developed through investment in many transport projects. Challenging targets for mode share for public transport have been set by public policy. It is therefore vitally important that, if more people are to be aware of more and better services, public transport information is integrated, comprehensive, accurate and timely.

The vision of an integrated comprehensive public transport information domain is encapsulated in the suggested draft vision statement presented in this report:

> *Information for people that will reliably tell them how, where and when they can travel in Dublin and its environs by public transport.*

The vision statement is deliberately simple and passenger focused; however, its simplicity hides a requirement for complex systems to be set up to deliver seamless integrated public transport information.

The operation of these systems, in addition to acting together in bringing integrated information for passengers to fruition, will also bring benefits to operators themselves, and to regulatory interests. Systems that are built on automatically locating vehicles and monitoring their performance in terms of timetable adherence provide information to service providers, traffic managers and regulatory interests. Information is the power to do something about the causes of unreliability; without information, there is no appreciation of the appropriateness of potential actions.

10.2 Study Findings

This study has found that

a) There is a firm commitment to establish a regulatory body for public transport in the GDA; however, the precise form of this is as yet undetermined, and there is likely to be some elapsed time before this takes place,

b) There is an articulated demand for an integrated PTI system, including RTPI,

c) The current public transport information provided is inconsistent, and is not integrated,

d) Existing operators have disparate plans for individual projects that are not integrated, are proceeding at different timescales, and have different objectives,

e) There is a gap between the current existing and planned level of public transport information and the vision of what is required, as articulated in

the vision statement and outlined in the DTO transport strategy *A Platform for Change,*

f) Stakeholders agree that change is necessary, but it needs to take place within a policy on integrated public transport, and integrated public transport information in particular. They also desire a strong lead organisation to co-ordinate PTI and RTPI provision

g) Successful integrated PTI, including RTPI, will take considerable initial and on-going resources and effort, and requires a strategic road map to guide the activities of all agencies,

h) This road map, on technological and institutional fronts, is the proposed strategy,

i) Successful integrated PTI, including RTPI, does not necessarily have to wait for the onset of the new regulatory arrangements. In the hiatus, co-operation and commitment between various agencies and operators can bring about a quantum improvement.

j) Without this commitment to acting in a partnership approach, the potential to waste resources in investing in individual initiatives and systems exists,

k) Considerable benefits will accrue to passengers, operators and regulatory interests as a result of implementing the proposed strategy.

One of the most important issues in successfully implementing the strategy is creating, maintaining and managing databases of accurate information on which information services are based. The public want something they can trust and rely upon. The operators and regulatory interests need to be able to cooperate to each other's mutual benefit. Thus the study has concluded that there must be two strands to implementing a successful Public Transport Information and Real Time Passenger Information Strategy (PTI & RTPI) for the GDA:

- The System Architecture – concerning the design, procurement, linking together and use of the technology and infrastructure across all transport modes to gather, process and deliver the right information to users.
- The Business Architecture – covering branding and publicity, institutional and regulatory responsibilities, and championing the strategy (politically and institutionally)

10.3 Recommended Strategy

The strategy recommended by Atkins involves further studies/ actions / initiatives involving an estimated €36.9m. This expenditure will be over a period of some 6 years. This is not necessarily Exchequer funding, and further work is required to identify sources of funding for individual elements of the proposed strategy. Exchequer funds will initially be required to some extent, to seed the activity, and Atkins' estimate is that this funding will be of the order of €23.5m (includes local authority spend of €2.75m).

10.3.1 System Architecture Recommendations

The System Architecture concerns the technology and telecommunications to deliver the information services. In the detail it identifies how everything can be linked together to act as a coherent whole.

Recommendation	Benefit
Accurately locate, uniquely number and name every stop and create a database	Exact positioning and agreed naming of stops bring efficiency to their administration. When stored electronically journey planners for the internet and call centres can identify the nearest best stop from actual origins and destinations
Fitting every bus, tram and train with satellite positioning technology	Operators are able to see where their vehicles on their travel through the streets. Automatically, without human intervention announcements can be made, information displayed updated for passengers, ticket machines can know which stop they are at.
Analysing tracked data	A true picture of how public transport operates in the GDA can be built up from the tracked data. It will be possible to identify where and when delays occur enabling changes to service patterns and to traffic signal phasing.
Real time timetables	For the first time it will be possible to compare each and every actual journey on a route. From this information it will be possible to produce reliable timetables specific to each stop.
Communication Network Study	Carry out a study to establish the most cost effective solution for data communication to support vehicle tracking, information provision and / or integrated ticketing. Examine the potential for shared use of networks.
Rail Legacy Systems Study	Carry out study to advise on the feasibility or otherwise of incorporating existing rail passenger information systems into the proposed strategy.
Real time tracking	Service providers will have additional tools to assist reduction of bunching on QBC's[36], and to keep to timetables on less frequent sections of route.
Implement on street RTPI at interchange points and other key locations	RTPI brings passenger comfort. By concentrating on interchange points and key services (e.g. airport connections) The best value, highest business case locations will be served first
Roll out of RTPI through other media	Internet, mobile phone, off route (e.g. shopping centres, libraries) delivery of information can follow once the system has been shown to work. Inspectors, information centres and Gardai could be issued with hand held PDA information units. The exploitation of the system should also allow the inclusion of fare information.

Table 10.1 - System Architecture Recommendations

[36] i.e. keep headways – if it is a 3 minute frequency but 3 buses come at once it has become a 9 minute frequency!

10.3.2 Business Architecture Recommendations

At the heart of the strategy is the need to change how PTI is delivered, and visibly. There is no need to wait, and it is in fact costly to wait, for the establishment of the new regulatory organisation. Proposed arrangements can then be subsumed into any strategic authority at a later date.

Recommendation	Benefit
Establish a PTI Management Committee and a PTI Office	Co-ordinate all PTI and RTPI activities through these agencies, and evaluate all applications for funding in the domain of PTI / RTPI through these agencies. Channel all future investment funds through these agencies. Both the Management Committee and the PTI Office should be independent and neutral of all public transport operators.
Common Branding for PTI	Establishing a single, easily recognisable brand for all transport information will be a major part of convincing the public of the move to a modern, integrated transport network
Bus Stop Authority	The PTI Office will hold all records and have ultimate responsibility for the location, naming and upkeep (through Local Authorities) of bus stops[37]. It will liaise with the Gardai and local authorities and bus companies. There will not be the one stop per bus company situation currently seen.
Boarding Point Guidelines	A handbook of minimum street furniture and information provision. It will cover a range of layouts to suit all locations from taxi rank to tram platform, rail station to bus stop. It will contain directives on the use of available space to provide static information and real time services incorporating good practice for accessibility and special needs.
Data agreements and Processes	All operators and authorities agree how and when to provide certain data in certain agreed formats to each other and to the PTI Office. Minimum level of service to be expected from the PTI Office to be defined.
Sources of Funding	Carry out work on alternative to Exchequer sources of funding i.e. fare levies, private sector involvement,

Table 10.2 – Business Architecture Recommendations

10.4 Next Steps

Atkins Consultants have produced this report to advise the PTI/RTPI Committee set up by the DTO at the instigation of the DoT to advise on the formulation of a PTI/RTPI Strategy for the GDA. Assuming this committee are able to endorse the report the next step should be to establish a PTI Managing Committee, with a budget of €2.28m from exchequer funds in 2003 to resource and realize the initial work of the PTI Office and staff, and unequivocal relationship lines between it and other sectoral players. The DoT

[37] The term bus stop in this instance refers to the pole

should set a deadline for a decision by the PTI Managing Committee assisted by the PTI Office on

- A timeline for the design, production and installation of network maps and local area maps at major rail stations and bus stops, to be agreed with operators.
- A timeline for the design, production and launch of a common website and timetable directory/reference book of all licensed and exempted public transport services in the Greater Dublin Area.
- A brand for integrated PTI in the Greater Dublin Area.
- A set of boarding point design guidelines for all public transport modes including taxi
- A set of conditions pertaining to the domain of information for future franchisees within the bus network to participate in the integrated PTI system for GDA
- Carry out a study to determine the optimal communications network and the most cost effective implementation approach for RTPI development
- Carry out a study to determine how to integrate legacy proprietary PTI & RTPI platforms on the rail network into the overarching multimodal PTI and RTPI strategy.
- Carry out a study to examine alternatives to exchequer funding through greater operator, passenger and private sector involvement.

Furthermore, an immediate moratorium on exchequer funding of individual public transport operator PTI and RTPI initiatives should be put in place. This suspension should last until examination of each scheme's integration potential within the strategy is undertaken. Any future public funds should be channelled through the PTI Managing Committee. This will not however preclude operators from funding their public transport initiatives from 'own resources'.

10.5 Concluding remarks

The GDA requires excellent PTI and RTPI to encourage its citizens to use public transport in much greater numbers. This report has shown that there technological solutions could be implemented to help achieve this goal. Together with the other changes proposed in public transport regulation and provision the target mode shift by 2016 expected by *A Platform for Change* can be achieved.

APPENDIX A

DTO RTPI Committee Members

A. DTO RPTI Committee Members

NAME	ORGANISATION	POSITION
James Caffrey	Department of Transport	Technology Specialist
Gerry Glackin	Department of Transport	Public Transport Planning Division
Sharon Gleeson	Department of Transport	Regulatory Affairs
Marian Wilson	Dublin Transportation Office	Senior Transport Planner
Tony McEvoy	Railway Procurement Agency	Control Systems Engineer
Mick McMahon	Iarnrod Eireann	IT Manager
Brendan Flynn	Dublin Bus	Technology Manager
Sean Forde	Bus Eireann	Business Development
Mike Goodliffe	PAMBO	
Frank King	FOTO	
Deirdre O'Neill	Dublin City Council	Executive Engineer
Donie O'Shea	National Disability Authority	Senior Policy & Public Affairs Advisor
Margaret O'Mahony	Trinity College Dublin	Department of Civil Engineering

APPENDIX B

Terms of Reference for the DTO Committee on Real-Time Passenger Information Systems

B. Terms of Reference for the DTO Committee on Real-Time Passenger Information Systems

The DTO has established a committee on Real-Time Passenger Information for the Greater Dublin Area to

- Establish the broad framework of travel information systems within which RTPI systems will operate
- Commission an independent consultant to issue, within 6 months, a report on a recommended approach to developing an integrated RTPI system that meets the objectives set for it, is in accordance with the DTO transport strategy "A Platform for Change" and draws on experience of best practice in RTPI systems abroad. The report will include, inter alia
    a) An assessment of the broad framework of travel information systems as agreed by the committee and a validation of the objectives set for RTPI systems
    b) A comprehensive review of RTPI systems currently in operation in the GDA
    c) A list of possible RTPI projects that will achieve the objectives set in a) above
    d) The costs and benefits of these projects
    e) A list of recommended projects
    f) A proposed implementation plan for the recommended projects, including
- The phasing of the projects over the short, medium and longer term
- Action plans, including agency responsibility, for the short and medium terms which support the long term vision and objectives, and
- Institutional and funding implications of the recommended projects
- An assessment of the long term regulatory implications of the recommended approach

The Committee may be assisted by independent consultants to provide professional advice and to facilitate the Committee's work.

APPENDIX C

Brief to Consultants for a Study on a Strategy for a Public Transport Information Framework, including Real-Time Passenger Information

C. Introduction

The Dublin Transportation Office (DTO) invites consultants to tender for a study to formulate a strategy for a multi-mode Public Transport Information (PTI) system, including Real Time Passenger Information (RTPI), for the Greater Dublin Area (GDA). The scope of the study should be to identify the framework and system architecture, including data requirements, necessary for an integrated PTI system, and to identify a suitable implementation strategy with particular focus on any RTPI and other PTI elements that can be implemented in the short term. The DTO, in conjunction with the Department of Public Enterprise, has established a Committee to further the implementation of RTPI systems within the GDA. The successful consultant will advise this Committee and report to the DTO.

C.1 Planning and Transport Background

The DTO Strategy 2000-2016 *A Platform for Change* was published in September, 2000 and proposes a transport strategy designed to contribute to the achievement of Strategic Planning Guidelines (SPGs) goals for the GDA

The SPGs describe the desired size and form of the GDA. The SPGs are framed on the twin principles of

- Consolidating development in a designated Metropolitan Area to accommodate greater population than at present, together with
- Designating a series of sustainable development centres within an area known as the Hinterland Area, with both high quality public transport links to the Metropolitan Area and local public transport networks meeting local transport demand in a self-sustaining scenario.

A Platform for Change recommends a greatly expanded public transport network to serve the consolidated Metropolitan Area, and proposes to link sustainable development centres in the Hinterland Area to the Metropolitan Area by high quality rail and bus networks. There are also significant institutional changes proposed by the Departments of Environment and Local Government and Public Enterprise in a consultation document, entitled *New Institutional Arrangements for Land Use and Transport in the Greater Dublin Area*, which aim to establish a new Government authority to co-ordinate land use and transport planning, including regulation, for the GDA.

The policy on passenger information within the strategy is that comprehensive and accurate information on all public transport services should be made available to both users and intending users, at all points in the network, using all forms of media, including electronic media. The DTO has set out these views in a framework diagram of a Travel Information System, incorporating all modes and media (attached).

C.2 Consultant's Tasks

Specifically, the consultant will be asked to carry out the following tasks:

(i) Validate and comment upon the broad framework of Travel Information Systems as proposed by the DTO, of which Public Transport Information (PTI) framework forms a sub-set. (This task should not require significant resources.)

(ii) Validate and comment / expand upon the objectives already set by the RTPI Committee for RTPI systems within the PTI overarching strategy.

(iii) Issue, within 4 months, a report on a recommended approach to developing an integrated multi-mode PTI framework for the GDA including the following elements

- A comprehensive review of:
  - The current and planned approaches to PTI being undertaken by public transport operators in the GDA,
  - RTPI systems currently in operation or in the planning process.

The consultant will consult with public transport operators in the GDA in carrying out this review.

- A description of the open system architecture for a multi-mode public transport information system, independent of any particular institutional model, including, *inter alia,* the following:
  - what information is needed by passengers, intending passengers and the general public,
  - where it is needed,
  - when it is needed,
  - how it should be presented and disseminated,
  - the system architecture building blocks required,
  - the inputs / outputs and linkages of the proposed system,
  - additional uses of outputs
  - potential role and contribution of all stakeholders (including operator(s)) to the process of data provision and management.
- A list of possible PTI & RTPI projects that will achieve the objectives as validated above, and with particular emphasis on those projects that would be both beneficial and feasible to implement in the short term.
- The costs and benefits (including non-monetary benefits) to passengers, operator(s), and regulatory interests of these projects.
- A prioritised list of recommended projects
- A proposed implementation plan for the recommended projects, incorporating information management and including
- the phasing of the projects over the short, medium and longer term
- action plans, including agency responsibility, for the short and medium terms which support the long term vision and objectives of the PTI strategy, and
- institutional and funding implications of the recommended projects

- An assessment of the long term regulatory and institutional implications of the recommended approach to developing the overarching PTI framework.

C.3 Information to Consultants

The following documentation will be provided to consultants:

(i) Dublin Transportation Office Transport Strategy 2000 – 2016 *A Platform for Change* (September, 2000)

(ii) The Department of Public Enterprise's (DPE) and the Department of the Environment & Local Government's (DoELG) joint consultation paper "New Institutional Arrangements for Land Use and Transport in the Greater Dublin Area" (March, 2001)

(iii) The Terms of Reference of the DTO RTPI Committee

(iv) The Objectives of a Real Time Passenger Information system as proposed by the RTPI Committee.

(v) The synthesis of presentations by operators on Real Time Passenger Information to the DTO RTPI Committee as compiled by the DTO

C.4 Consultant's tender

Interested Consultants are invited to submit 4 copies of a tender (not exceeding 30 pages in length) for the study to the DTO for consideration, containing, *inter alia*

- summary interpretation of the brief to consultants (3 pages)
- proposed project methodology (including proposals for consultation with stakeholders, if any)
- proposed project team, including succinct details of **relevant** experience of key team members, their status within the organisation and the charge-out rate for each, and the schedule of each team member's involvement with the study.
- cost of the project, and schedule of expected payments
- Consultant's insurance details and tax clearance certificates.

Tenders should be marked 'PTI Tender' and should reach the DTO, Floor 3, Hainault House, 69 – 71, St. Stephen's Green, Dublin 2, Republic of Ireland by 16.30 hours on Friday, 24 May, 2002.

C.5 Study Period

It is anticipated that the study will take 4 months to complete, starting in June 2002 with anticipated completion in Autumn 2002.

APPENDIX D

Good Practice in providing the right information at the right time and place for the public transport passenger

D.1 Introduction

This Appendix builds on the concepts developed in Chapter 3 “A Vision for Public Transport Information in Dublin” in the main study report to provide an overview of the types of information required at each stage of a journey, focusing on common questions faced by passengers.

The examples presented illustrate good methods of communicating information to the passenger by highlighting the basic elements that should be considered when providing an information system and how to exploit the media used for communication to their maximum potential.

Providing examples of good practice will allow future systems to incorporate the best methods established for communicating the numerous aspects of travel information to passengers.

Within this Appendix are examples from around Europe and from Dublin. The PTI Office will need to decide on which aspects of good practice it retains and adopts. In some cases, e.g. printed timetable design, there are several methods.

Some key examples that should be taken forward:

- Simple Brand identity
- Clear guides and timetables using simple typefaces and legible maps
- Feature rich, easy to use internet journey planners
- Informative bus stop flags and full use of space on shelters and poles to provide information such as maps and timetables ***exclusively for that stop.***
- Well designed real time displays
- Accessible design

D.2 Existing Good Practice

There are many examples of good practice already in place on modes of transport in Dublin that can be extended, copied or enhanced. Furthermore there are some good examples existing in the city already:

D.2.1 Bus Éireann website

Clear and easy to use this well designed site gives information on services, routes and connections as well as providing e-commerce ticket booking.

CIE Group style

In common with other CIE sites it also available in a special high contrast text format for the visually impaired.

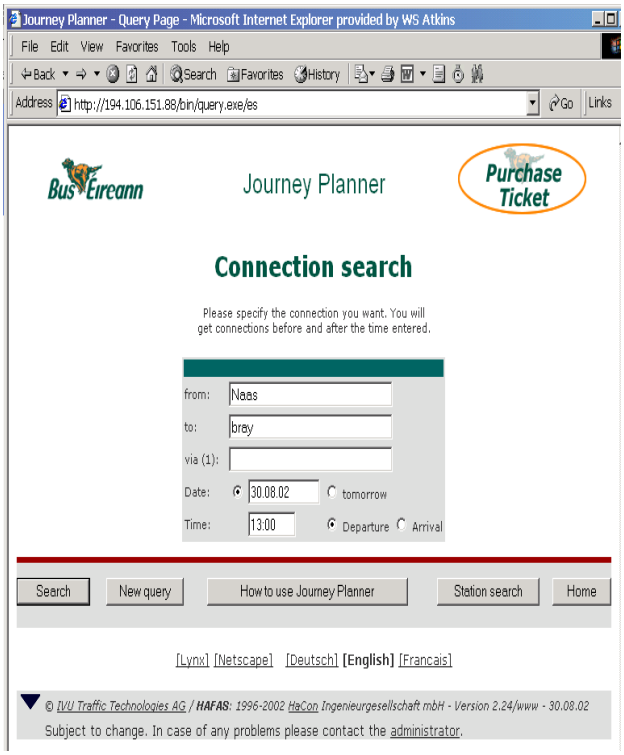


Figure D.1– Bus Éireann Website

D.2.2 DART RTPI

Every station on the DART has RTPI indicators advising of the next services and with the capability to provide other information in fixed and scrolling formats.

Figure D.2 – DART RTPI

Image from http://camera.ntrg.cs.tcd.ie/

D.2.3 Dublin Bus – Guide to Dublin Bus Services

The latest version published in March 2002 contains maps, service /route information, ticket details in a very clear manner.

This is exactly the sort of pocket document that visitors would expect to find in a city like Dublin.

Figure D.3 – Dublin Bus Guide to Services

D.2.4 Travel-WIRE Dublin

Set up during the BRIDGE-IT project in 2000 this portal site provides operator independent advice on travel in the Dublin Area, linking out to operator web sites as appropriate.

Part of TransitDublin's remit should be to present information in this unbiased way, something that with the advent of competition CIE would be unable to be seen to do.

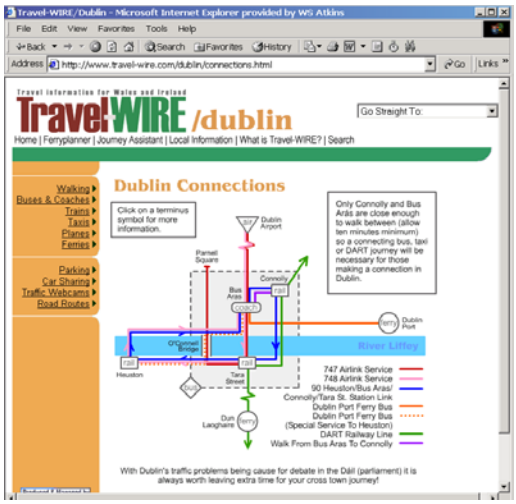


Figure D.4 – www.Travel-WIRE.com/dublin

D.3 Accessibility and Social Inclusion

D.3.1 General information design

In section 3.5 of the main report the importance of careful choice of fonts for PTI is stressed The Tiresias font, shown in Figure D.5 has been developed by the UK RNIB[1] specifically for ease of reading by the sight impaired.

Figure D.5 – Tiresias Font Example

The CIE2000 Font has been developed by CIE as a common font for use on public transport information. It is not known what testing has been done with the font for visually impaired use, but it may be a good alternative to Tiresias.

D.4 Accessibility Technology

Section 3.5.4 of the main report highlights the good practice design guidelines for IT based systems produced by the National Disability Authority (www.accessIT.nda.ie).

The section also highlights two examples of good practice for hearing and sight impaired users of public transport:

[1] http://www.tiresias.org/ is an excellent gateway to reports and links on the design of technology and its use by those with disabilities

- Provision of Hearing aid loops to aid comprehension on board, on platform and station, and when using customer information points
- Use of key fob transmitters to activate announcements from RTPI indicators (as done increasingly in the UK) and within and outside of PT vehicles (as provided in an increasing number of cities in the Czech Republic)

D.5 INFOPOLIS2 Guidelines

The EC INFOPOLIS2 project [1998-2000, see www.ul.ie/~infopolis/] aimed to improve user access to electronic intermodal traveller information by developing guidelines for the presentation of information. INFOPOLIS2 concentrated exclusively on information for Public Transport users, and particularly on intermodal Public Transport Information.

The INFOPOLIS reports provide good advice on the design and provision of information.

D.6 User Requirements for information in the GDA

In Section 3.2 of the main report the passenger requirements across seven identified stages of a typical journey are examined (see Figure D.6 [This is the same as Figure 3.1 in the main report]). The diagram also provides the mediums for providing information which can be either Static (printed timetables) or Dynamic (a Variable message sign). The information icon indicates which medium can be used to deliver relevant journey information at each particular stage.

Section D.6 identifies some good practice examples of the “global” requirements such as a highly visible branding. Section D.7contains examples of good practice at the various journey stages.

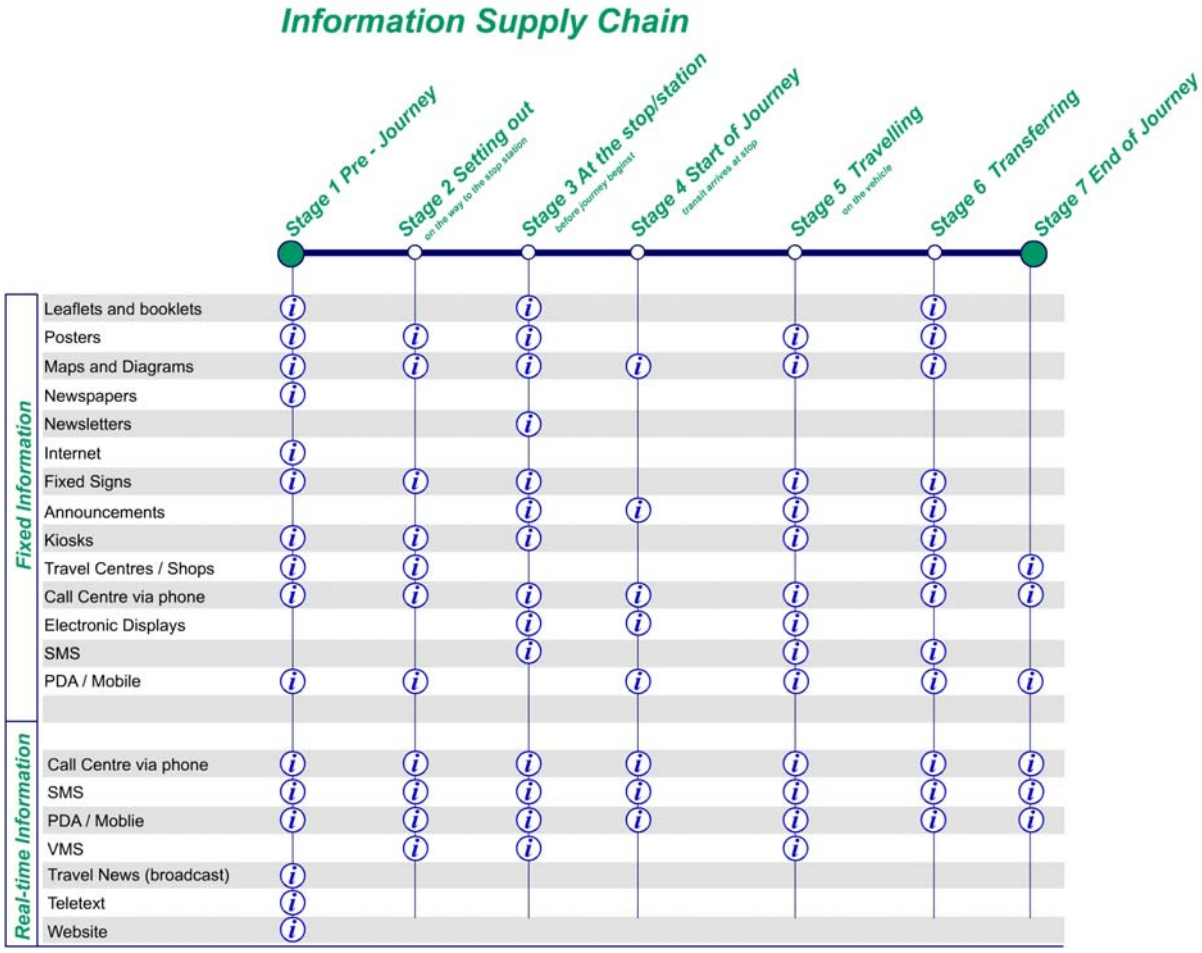


Figure D.6 – Information Requirements at stages of a journey

D.7 Basic Good Practice

D.7.1 User-Friendliness

It is important that the essential information is presented in an orderly and understandable way. It is also important that passengers do not get information 'overload'

D.7.2 Clarity

Information should be consistent to travellers travelling on all modes of transport. In terms of style and content, static and dynamic information should be presented in the same manor wherever possible.

Applying an identity to each mode of the transport network will help the traveller to quickly refer to the relevant information. This identity could be developed based on a colour coded symbol or letter. The use of icons for modes is used. In other cities similar approaches are used, but with the addition of a logo to identify bus companies etc. BVG has implemented this structure of identity on its' network. It is applied

across all of it's' information. Figure D.7 is a screenshot of a selection of their website http://www.bvg.de. Each of the mode identities is easily recognised which makes the location of mode specific information quick.

These identities appear on the relevant timetables for the mode. The identity helps to provide an integrated information supply.

Figure D.7 – BVG Service Icons

D.7.3 Integration

Static and dynamic information should complement each other and work together at the relevant stages in the journey. The implementation of information requires clear planning which is based on each stage of the journey.

D.7.4 Perception

Passengers do not expect to have to spend long time understanding the information or having to ask for information to be repeated. All information should be produced with the expected limitations of humans. It is important to use a clear font at the correct size. Colours should aid the understanding of information and not confuse, lighting may be required to see information, volume and pitch and speed of announcements should be clear.

D.7.5 Branding

Figure D.8 – Transport Identities. London, Paris, Berlin

Developing a brand which covers brings together modes of transport helps passengers to deal with public transport. The brand can help to provide a 'blanket' which brings together public transport. Travellers come to identify the brand and recognise it as a service to trust. Figure D.8 shows examples of a well known multi-modal brands. The brands are widely recognised by residents and visitors to the cities.

D.8 Examples of good Practice at each stage:

The examples of good practice will be given using the approach represented by Figure D.6 – Information Requirements at stages of a journey.

D.8.1 Stage 1 – Pre Journey

- Where do I want to go?
- What public transport services are available?
- Where is the nearest stop or station for me to catch the service?
- In which direction do I walk to get the stop / station?
- What time is the next service or how frequent is it?
- When do I want to go?
- How long is the journey?

Good Practice fro providing answers at Stage 1

Timetables - BVG Berlin (Germany)

BVG oversees and provides passenger information for all modes of public transport in Berlin. It operates an integrated service that has an easily recognisable uniform design. It provides timetables and route diagrams that are consistent across modes and at all points of the journey. The transit network offers 9 underground lines, 28 tram lines, 163 bus routes and 6 ferries.

BVG is a good example of how information can be presented consistently across different modes of transport. Timetables for all modes are presented in a similar format using the same font, colour and design. Using this approach helps to provide a service which is seamless (integrated). No additional effort is required of the traveller to understand different methods of timetables for different modes.

Figure D.9 is an example of a typical BVG timetable. The layout and style of the timetable is consistent across all modes of transport within Berlin.

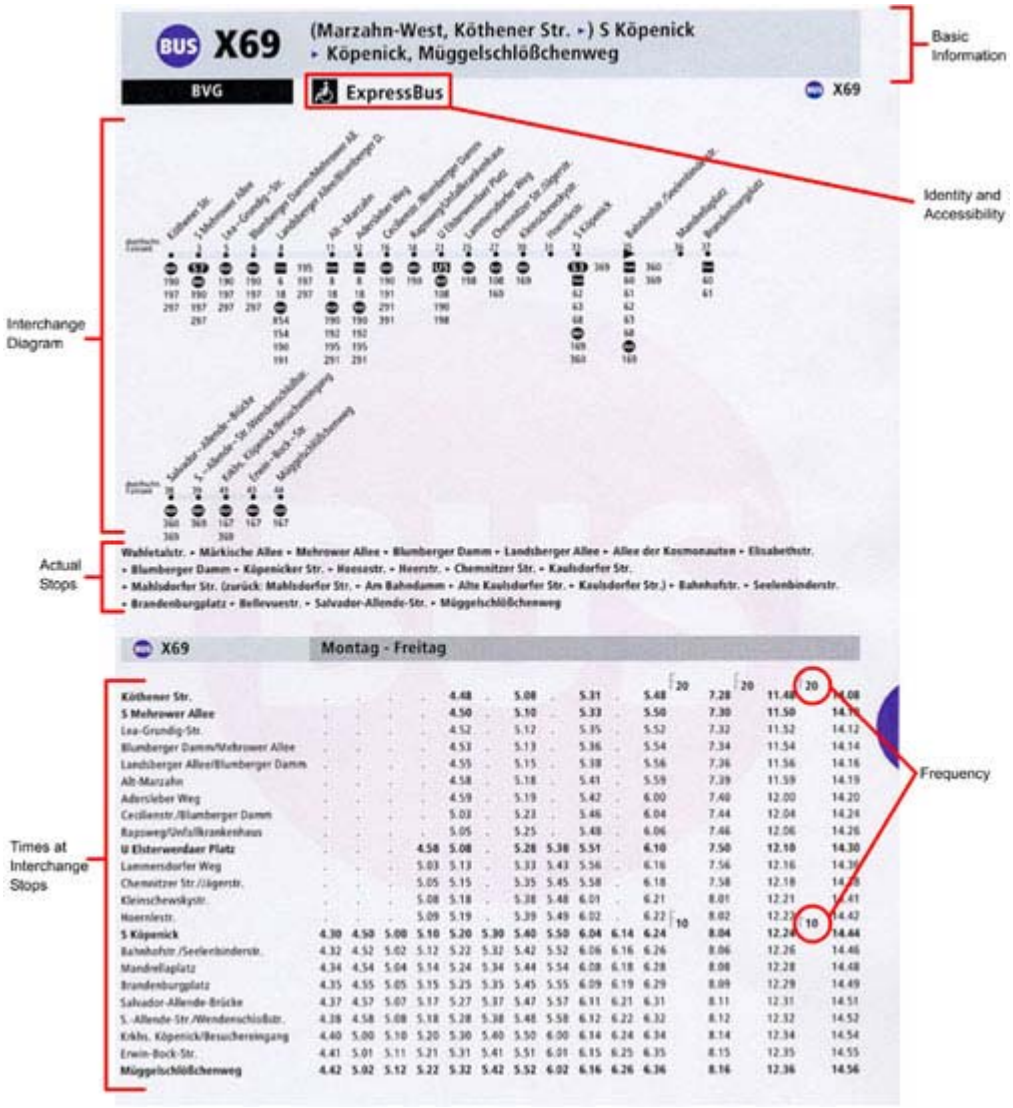


Figure D.9 – BVG Bus Timetable and Route diagram

Timetables - Mersey Travel Liverpool

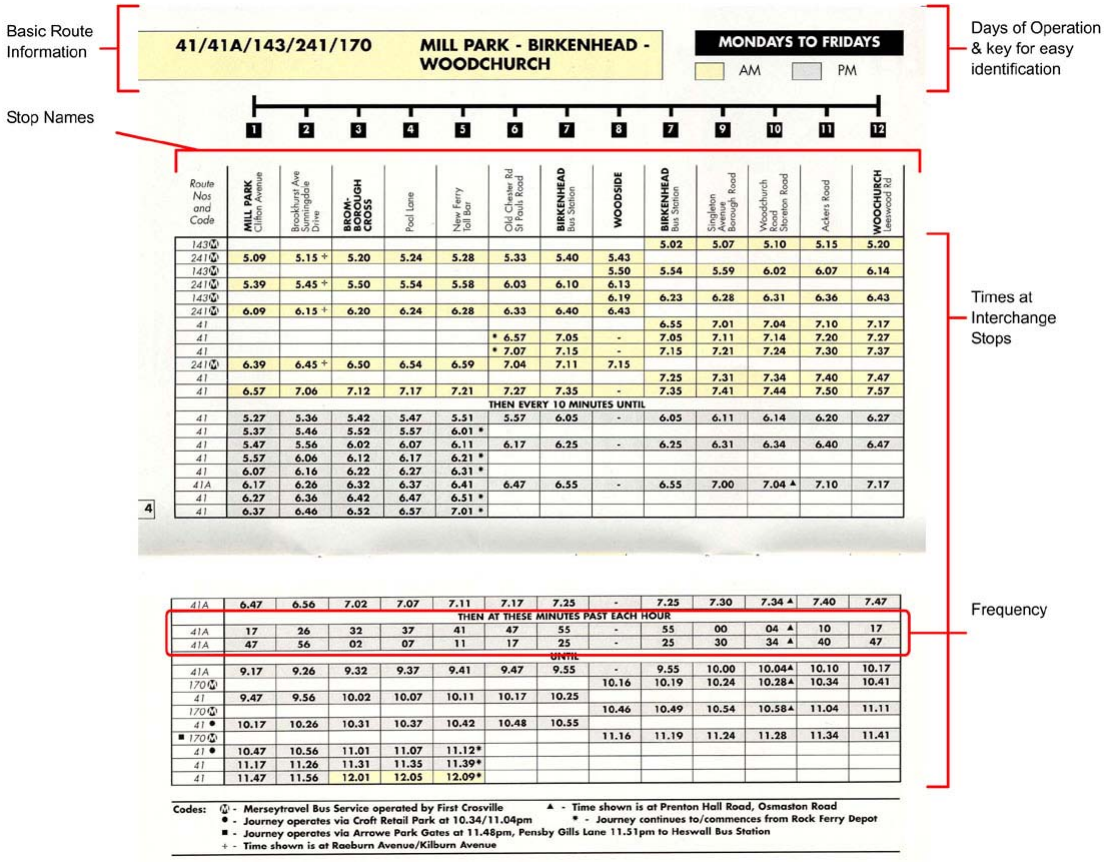


Figure D.10 – Merseytravel timetable example

The Merseytravel, Liverpool, timetable is a good example of presenting information in a clear and precise manner. Figure D.10 illustrates an example of a Merseytravel timetable.

- Basic service information is presented boldly at the top of the timetable
- The use of two light background colours aids the reader in their interpretation of the data by clearly identifying AM and PM times.
- The timetable shows each of the intermediate stops and there scheduled arrival times.

Timetables – Vasttrafik (Gothenburg)

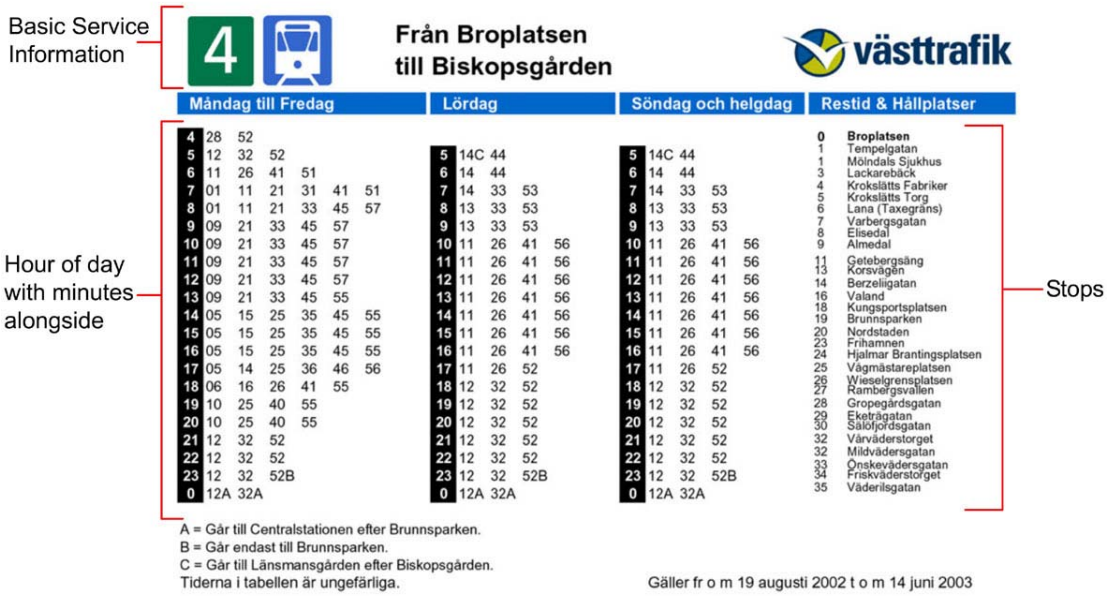


Figure D.11 – Vasttraffik timetable example

Figure D.11 illustrates another good example of a printed timetable.

- Each hour is highlighted along the left side to allow easy reference. The minutes of buses arriving within that hour is displayed alongside each hour.
- Basic service information is clearly shown using there common mode symbol and service number

Journey planners - Die Bahn Travel Service (Germany)

Die Bahn (German Railways) is the equivalent to Iarnrod Éireann's Internet Journey Planner. It has been selected as an example of good practice because of its' additional features which are incorporated into its journey planner.

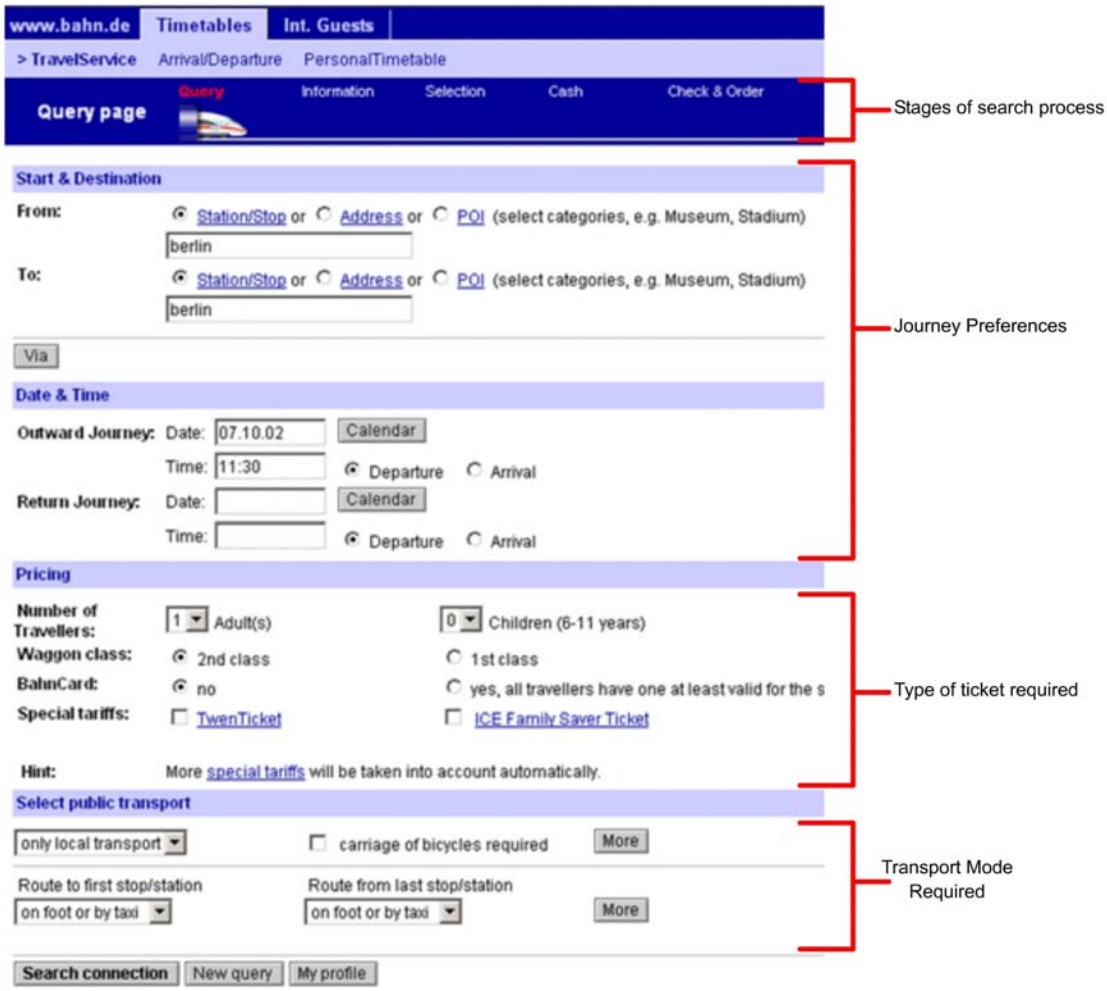


Figure D.12 – Die Bahn Journey Planner - input screen

It is essentially a train time's journey planner; however, it has the options to including all other modes of travel within the itinerary. Features also include the options to create and download a personal journey planner and view environmental data on your journey compared to the same journey by car. Figure D.13 shows an example of the output given for an environmental comparison between public transport and car.

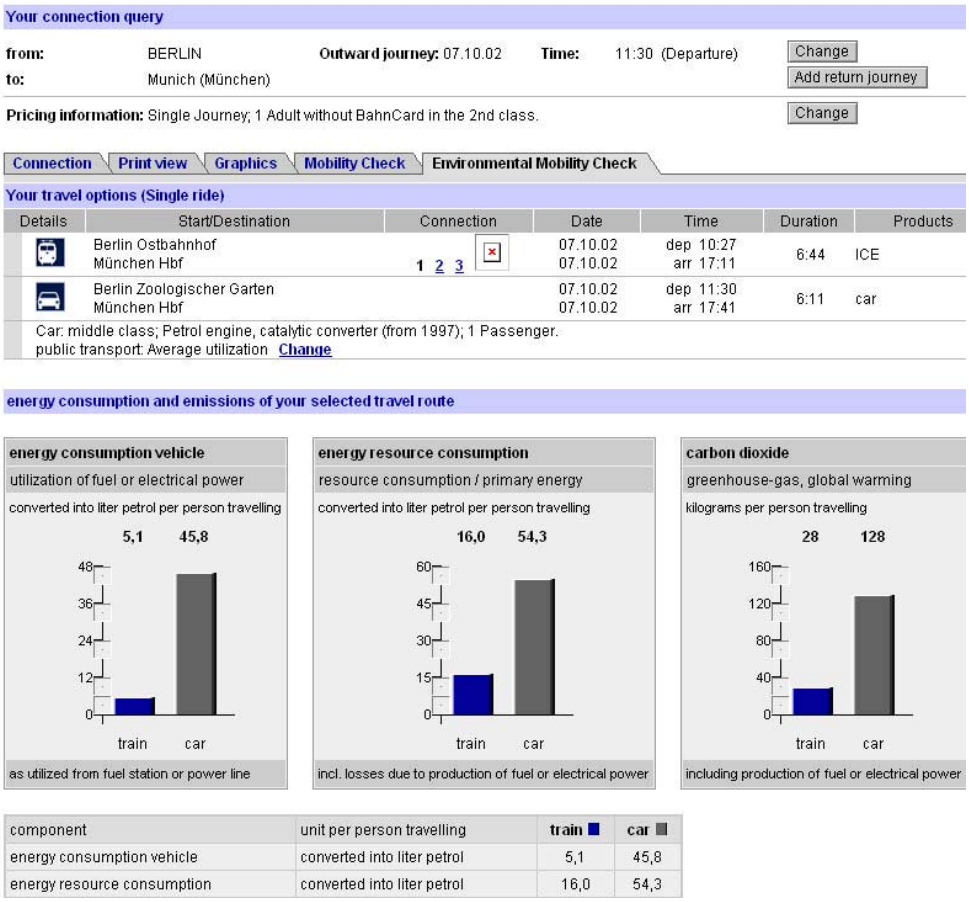


Figure D.13 – Die Bahn Journey Planner– Environmental Output screen

Journey planners - Traveline (United Kingdom)

Traveline is a national service which was developed in response to the UK Government's aspirations for a means of bringing about 'delivery' of national public transport information service based on a single point of access for all multi-modal public transport enquiries. There was no legislative obligation for information providers to co-operate in the initiative, although there has been clear guidance from Government to local authorities to consider the importance of information provision in their bids for capital funds.

A series of call centres (telephone enquiry service - accessed through a national telephone number 0870 628 0 628), corresponding to nine regions across the UK, plus Scotland and Wales, have and share their respective information databases. Each call centre region, comprises local authorities and bus operators, and carries information on local and in some cases adjacent areas, as well as national information for coaches and trains. Communication between operatives at different call centres or between the enquirer and operatives at different call centres is necessary to obtain the response to an enquiry for a journey spanning more than one region.

In due course, it is likely that developments, such as those within JourneyWeb, will be used to achieve back-office integration such that an operative at one call centre can automatically obtain response details for a multi-stage/multi-region journey enquiry.

Each region's journey planning system is now widely available to the travelling public through the national traveline portal[2]. Figure D.14 shows an example of the East Anglia internet journey planner.

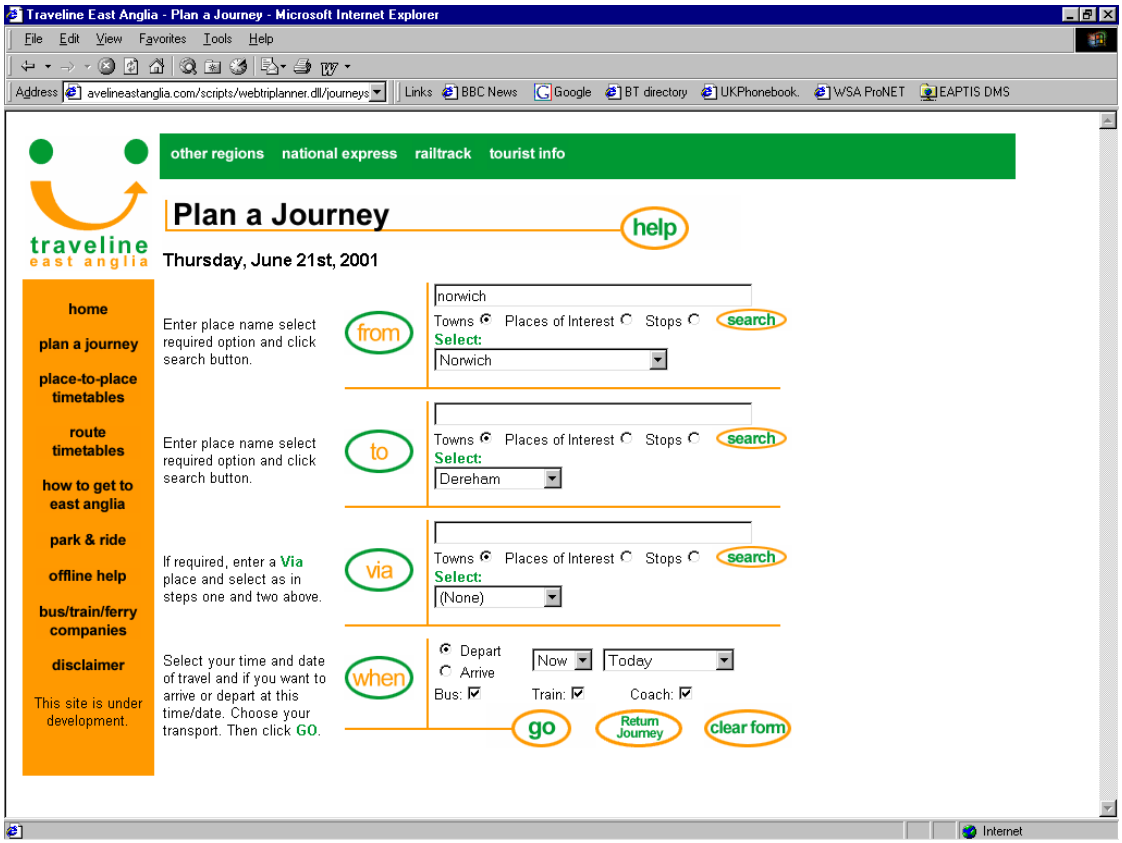


Figure D.14 – Traveline Journey Planner– Internet Access

The Railtrack website[3] provides national rail service times and routeings. Through an arrangement with Kizoom, WAP phone users can request information about trains directly from their handset. They can also visit a specially designed website, via a link on the Railtrack website, to register their travel details and receive personalised in-journey timetable information for free (excluding the cost of the call).

[2] www.traveline.org.uk
[3] www.railtrack.co.uk

Figure D.15 – Railtrack WAP Journey Planner

D.8.2 Stage 2 – Setting Out

- Am I going the right way?
- How much further is it?
- Is my service on time or are there delays?

Good Practice for providing answers at stage 2:

On-street signs

Simple on street directional signs are essential to direct passengers to services. Within the city centre the directions can be integrated into other typical direction signs.

Sometimes stops or stations can be hidden away and these may require specific signing. The signing should make use of established symbols and colour codes for the specific mode(s).

Transport for London (Tfl) WAP and SMS Travel Alerts

Recently transport for London launched a new "personal alerts service" for the London Underground. Figure D.16 shows a preference page on the Tfl website where the user can select a route and the times they wish to receive travel alerts.

Note that the menu for the TfL site is multi-modal.

This service allows users to;

- Receive the latest news on the Underground, including disruptions and closures.
- Receive longer term information on London Buses and River services.
- Access London related WAP travel services, including Train timetables and real-time travel information.
- Find travel hotline numbers, lost property advice and other information useful for London travellers on the move.

The SMS and WAP services are integrated into pages which are located within Tfl website. The user is required to register and set journey preferences for which they wish to receive information.

Passengers with WAP enabled phones are able to access there profile using a modified version of the Tfl website, including a journey planner.

A personal alert service, although in its early stages is a highly useful source of information throughout the journey but particularly in the pre journey stage. This is an example of a service passengers are expecting in today's society. As mobile technology improves, the ability to add improved functionality is likely to lead to an increased demand for personal travel services.

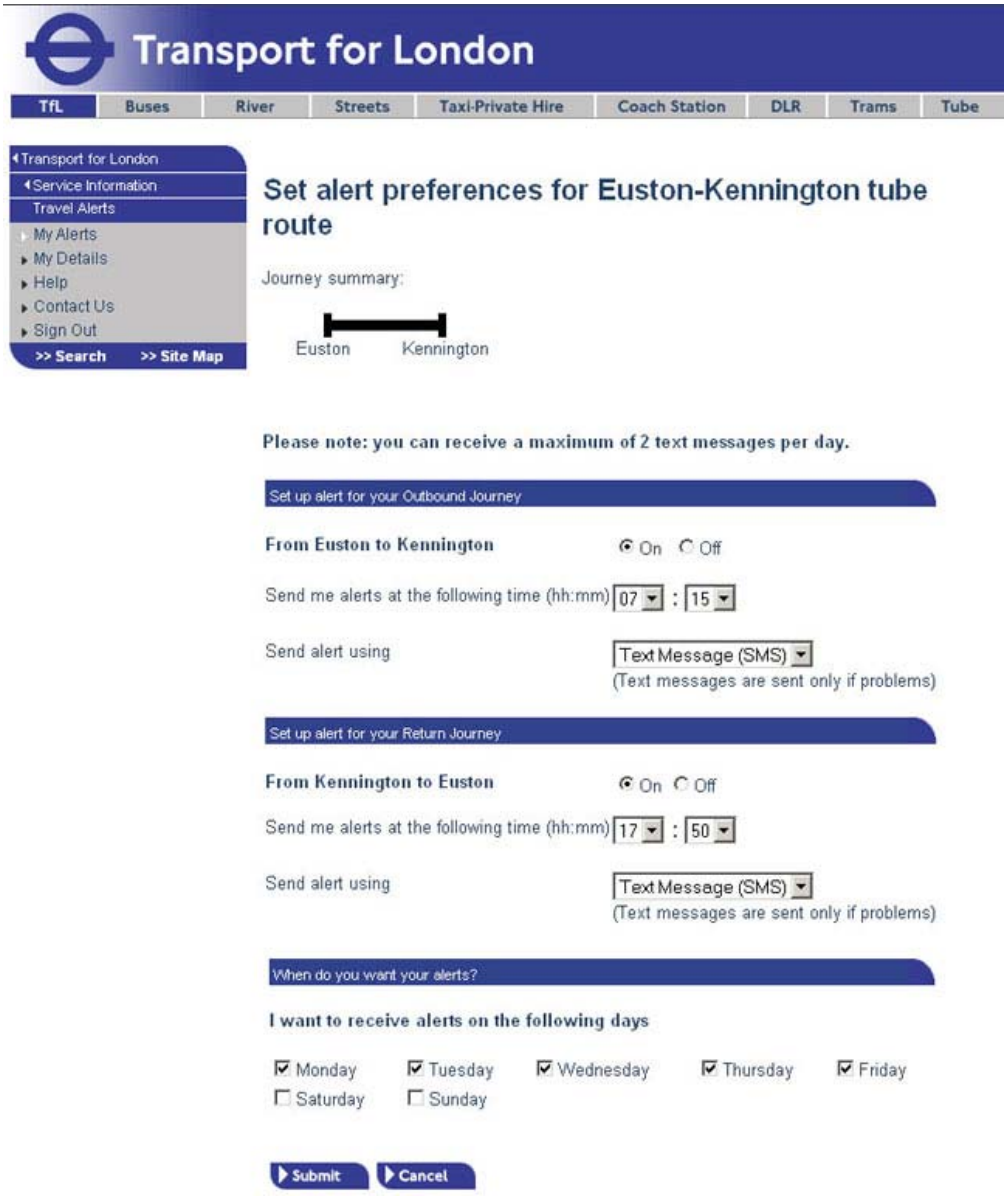


Figure D.16 - Tfl personal travel alerts

D.8.3 Stage 3 – At the stop/station

- Is this the right stop or station?
- How long will I have to wait?
- Can I rely on the printed timetable information?
- Is all the information consistent?
- What are the departure times from this stop?
- Is my waiting area clean and in good repair? Do I feel safe waiting here?

Good Practice for providing answers at stage 3:

Bus Stop Information - GMPTE Manchester

For many travellers the bus stop is the entry onto Dublin's public transport system. At this point there are many expectations made by the passenger one of which is access to information, particularly for infrequent travellers or those who are visiting the Greater Dublin Area (GDA). At present The GDA has approximately 5500 stops it is important that each of these entry points are resourced with quality up to date information which will provide confidence in the services which are operating.

There is a minimum basic level of information that should be provided at every bus stop. GMPTE, Manchester is an example of good practice for bus stop information:

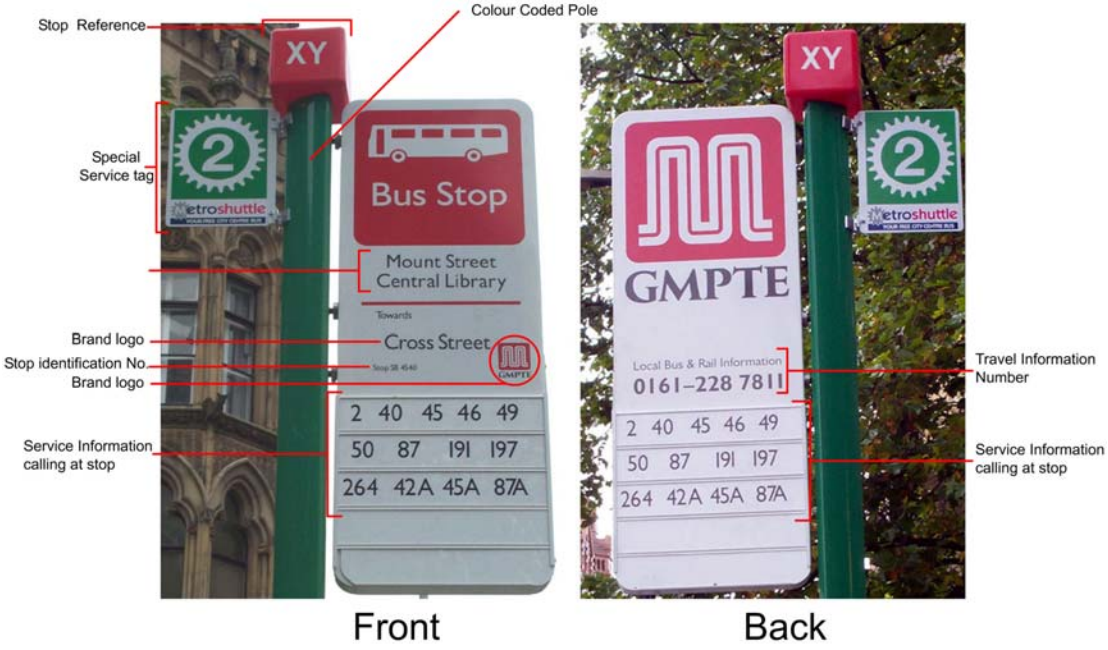


Figure D.17 - Front and reverse of a GMPTE bus stop flag

Information at each stop includes;

- name of the stop
- services operating from that stop
- scheduled departures

- Telephone Enquiry Numbers
- destination of the route
- stand reference.

The specific example in Figure D.17 also illustrates how GMPTE have used a green colour code and an additional "Metroshuttle 2" tag to indicate a "Special Service" [a free shuttle route which circulates the city centre]. In practice there is no reason why bus stop style flags could not be used to display information on a rail or tram platform. This would provide another element of consistency throughout the network.

Wherever viable GMPTE has a modern shelter with an information display unit, lighting and seating. The shelter allows further comprehensive information to be displayed within the shelter. The display unit information should consist of:

- Operators calling at the stop
- Bus stop name and/or stand reference for the stop
- Bus services calling at the stop
- Stop Specific information
- Timetables (Departure times for each of the services)
  - A route diagram showing the route of the service and the stopping points
  - Fares information and methods of payment
  - Travel information phone numbers (Operators or other enquiry number)
  - Local area map
  - Bus stop location guide

Figure D.18 shows an example of passenger information displayed in shelter in Gdansk where transport funding is low at present.

Figure D.18 – Information Displayed in a shelter in Gdansk, Poland

Bus Stop Reference Guide, Dublin Bus

"Where to find your bus" maps can be a helpful guide to those not familiar with the bus network.

Figure D.19 shows an example of Dublin Bus' guide to locating a bus in the College Green/ Burgh Quay area. Each of the stops in the area is given a reference letter and colour coded. Inbound buses are marked blue and outward bound in Red. This information is then mapped next to the service numbers in the chart below.

GMPTE, Manchester have taken this concept one step further and now display a two letter reference on the top of each stop. This reference is taken from the "Where to find your bus" map which has a similar concept to Dublin Bus.

Figure D.19 – Dublin Bus, Where to Board Your Bus

West Yorkshire Bus Stations

At many bus stations in West Yorkshire a push button facility is provided to identify each stand and the services provided using audio.

Fare Information Dublin Bus

Although bus fares are relatively low cost compared to other modes of travel, information on the fare structure should be clearly displayed at the stop. Dublin Bus provide a fare scheme for the route the stop is situated on. Figure D.20 is an example of fare information which is supplied at the bus stops.

Figure D.20 – Dublin Bus Fare Information

Real Time Information – Gothenburg

Technology used to display real-time information at the bus stop is continuing to evolve. In Gothenburg the latest real-time information displays have been installed. (See Figure D.21)

Figure D.22 shows a large number of routes which are displayed in colour. The colour screen allows the passenger to easily identify their route and should be consistent with the colours used to display the routes on printed material.

Placing the real-time information above the scheduled information as in Figure D.21, allows a comparison to be made between the scheduled departure time and the actual departure time. Each real time display is updated every 30 seconds.

The real time signs are visible in high sunlight and the typography has been developed to be read easily.

Figure D.21 – Real time route information above scheduled information

Figure D.22 – Colour Real-time information display

D.8.4 Stage 4 – Start of Journey

- Is this the service I require?
- How much will my journey cost?
- How long will the journey take?
- How many intermediate stops are there?
- Is the next service the one with the shortest time to my destination?

Good Practice for providing answers at stage 4:

As the service arrives at the stop/station it is crucial that the service number and destination, at least, is displayed on the front of the vehicle. It will also be reassuring for passenger to find the service number and brief route information on the side of the vehicle as they are boarding

It is important that consistency is maintained, it may be useful to use some level of colour coding which would be familiar to the passenger from using timetable booklets.

Public announcements via Electronic displays, public address system also help to reassure the traveller.

D.8.5 Stage 5 – Travelling

- Am I on the right service? Heading In the right direction?
- When do I get off?
- How long will my journey take?
- Where do I need to get off to make a connection?
- Is my connection on time? / Will I make my connection?

Good Practice for providing answers at stage 5:

Passengers require reassurance that they are on the correct service. Often they arrive just in time to catch the service and have not had time to access information. Public announcements or an in vehicle information panel, static or dynamic can reassure the passenger that they are on the service they require. It is worth displaying all of the intermediate stops.

Whilst travelling it is useful to provide information on transferring at interchanges, a route map, fare procedures and a telephone enquiry number.

It is also important to keep passengers up to date on the progress of their journey. If there are delays, a public announcement should be made or displayed. Much of this supply of information currently relies on staffs who receive information from the control rooms.

If there is an expectation for on-board staff to provide passenger information it is essential that processes and facilities are in place to allow a ticket inspector to receive or access quality information.

Vulnerable Users - The Command Rig System, Prague, Czech Republic

In the Czech Republic a system has been developed to help the sightless use public transport. The system provides vocal and acoustic information at key points in the transport network.

A sightless passenger is able to request information using either a separate transmitter key fob or a transmitted built into their white stick.

For example, when a vehicle arrives at a stop the passenger can press a button to activate a loud speaker to announce the service number, and direction. If the passenger wishes to board the vehicle then another button can be pressed to activate a loud speaker and display to alert the driver. A similar process is used to leave the bus.

This system is a good example of how an additional feature of a passenger information could encourage sightless travellers to use public transport by starting to eliminate a barrier which at present can prevent them from using public transport.

D.8.6 Stage 6 – Transferring

- Will I make my connection?
- How do I get to the next service?
- Do I have to pay again? (and if so where do I pay?)
- Are there any stairs / lifts / escalators or (if on street) any crossings?
- Is my service on time?

Good Practice for providing answers at stage 6:

Fixed signs are an essential means of directing the traveller to stop and stations, especially during transfer. It may be necessary for the traveller to quickly find their way from a bus to a train. Signing must be clear, simple and consistent.

It is important to use international symbols where possible to avoid confusion and symbols for each mode of travel. These symbols would be consistent with those found on the timetables.

Figure D.23 illustrates an example of a Dublin Railway schematic diagram. Modifications to overlay the Dublin bus network over this map would provide a useful interchange diagram for passengers to reference to.

Figure D.23 – Propose GDA Rail Network Schematic and Interchanges

D.8.7 Stage 7 – End of Journey

- How do I get to "……." Street?
- Where can I get a taxi?
- Where can I comment on the service?
- Where can I get information on the service I have used or for my return journey?
- Where can I enquire about lost property?

Good Practice for providing answers at stage 7:

Local Area Map

The majority of public transport journeys end with a walking stage. A local map which could be displayed inside a bus shelter or at the station is a useful reference for travellers to locate there final destination. The map should be clear, concise and use land marks were possible; such as a museum or pub. It is also good practice to display the map based on the alignment that the traveller is facing to avoid confusion.

Figure D.24 – Euston Local Area Map shows a good example of a local area map which provides travellers with orientation from the stop and indicates the location of facilities in the local area.

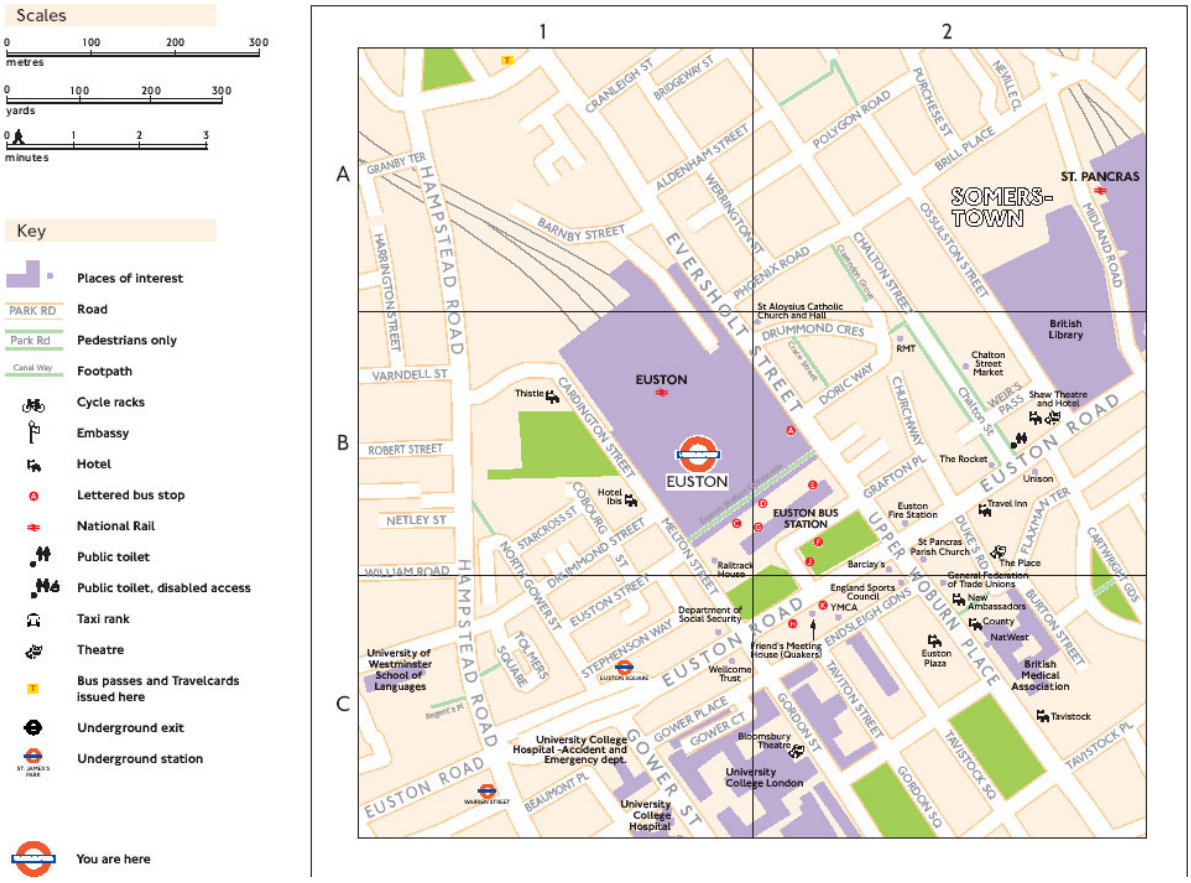


Figure D.24 – Euston Local Area Map

Figure D.25 shows an alternative style of local area map. The interactive maps were developed specifically for the web but are also available in a printable form to download. The local maps indicate facilities including;

- Parking
- Telephones
- Bus stops / stations
- Pharmacies
- WC
- Information points
- Street names

Each map contains 'hotspots' which can be selected to show a picture of that specific location. The pictures help the traveller to orientate themselves.

Figure D.25 – Travel-WIRE Local Area Map, Dolgellau, Wales

Feedback

Service to the passenger does not end once they leave the network. It is important that passengers have information on where and how they can make comments on the service or collect lost items. This facility should be advertised at points throughout the journey.

APPENDIX E

Synopsis of Consultation Exercise

E. Introduction

E.1 Stakeholder Consultation: Objectives, Scope and Approach

A Stakeholder Consultation exercise was carried out during July/August 2002 to support the PTI/RTPI study. The stakeholders included the main authorities, transport operators, representative organisations and agencies.

All consultees were sent a brochure (reproduced at the end of this Appendix) describing the aims and objectives of the study and consultation.

Chapter 4 of the main report takes forward the conclusions and opinions of the consultation exercise.

The consultation with Iarnród Éireann revealed a number of specific issues relating to the rail information environment. This is covered in more detail in Section E.3.

E.1.1 Consultation Objectives

This exercise had the objectives :

- To consult with the Stakeholders in order to :
  - Establish roles and responsibilities
  - Identify current systems and PTI services
  - Elicit opinions on direction and opportunities
  - Elicit concerns, interests, and potential conflicts
- To stimulate awareness of the PTI/RTPI project
  - Through generating a common thread of discussion
  - Through interactive sessions
- To act as a preparatory action for a Workshop held on 2 September 2002

The approach was to design a one-to-one interview with relevant representatives of the target organisations. These sessions were designed to last about an hour, although some lasted considerably longer. This time envelope was selected as being sufficient to get into detail and to encourage the respondent to open up, but at the same time not creating an excessive burden on the availability of busy people.

A further “second tier” consultation requesting written submissions was made via letter by the DTO. This second tier consultation ensured widest knowledge of the existence of the study.

E.1.2 Consultees

With the assistance of the DTO, the Consultant identified the primary stakeholders to be consulted, which would reflect the interests within the Greater Dublin Area. Stakeholders were selected within the categories:

- Authority
- Operator
- Representative Organisation
- Agency
- Other

In total, 21 consultations have been carried out as identified in Table E.1 below.

Stakeholder Type	Organisation
Authority	Department of Transport Dublin City Council Kildare County Council
Transport Operator	AerDART Air Coach Bus Átha Cliath Bus Eireann CIE Group Iarnród Eireann National Radio Cabs
Representative Organisation	Dublin Chamber of Commerce Dublin City Business Association FOTO National Disability Association PAMBO
Agency	Aer Rianta Dublin Transportation Office National Roads Agency Rail Procurement Agency
Other	Trinity College Foras na Gaeilge

Table E.1 - Stakeholders consulted within the Consultation Exercise

There were a small number of responses from the second tier consultees, most notably AA Roadwatch.

E.1.3 Consultation Approach

The approach was to design a one-to-one interview with relevant representatives of the target organisations. The Stakeholders were presented with a scenario based on a transport authority which would both regulate the public transport provision and would take the lead on the provision of PTI/RTPI. The Consultations with the stakeholders represented about 50 hours of interviews. This Appendix records the key findings.

The interview structure was designed by the Consultant to meet the objectives above. It consisted of 11 question areas, supported by a possible scenario for the future organisation of public transport in the Greater Dublin Area, and for the provision of integrated PTI/RTPI. The interview covered four key themes:

- Current roles and responsibilities, current systems, planned systems (Q1-Q3)
- Organisational arrangements under a new scenario (Q4-Q6)
- Ownership and management of assets and systems (Q7-Q9)
- Priorities and ideas for information to users (Q10-Q11)

The interview was designed to facilitate open discussion, since the capacity to implement any recommended actions will be dependent on the business interests, vision, willingness to innovate and willingness to co-operate of the various stakeholders.

E.2 Current and Planned Technology Systems

The consultation exercise identified a large range of PTI tools – tangible product, services, data, and support systems. These can be classified as a set of “building blocks” which may form part of any future integrated PTI/RTPI scenario:

- Published timetables and brochures
- Infrastructure : stops, shelters, stations, terminals
- At-stop/at-station static information carriers and content
- Websites
- Journey planners
- Databases
- Mapping and geo-referencing tools
- Vehicle tracking systems
- Own-account and third party delivery channels
- Call centres

It is not practical to present a complete inventory within this current report. Instead, this section highlights and clusters the most significant elements which have been identified. While aiming to be as comprehensive as possible, we also take into account the significance in terms of coverage, market penetration and potential for the future.

E.2.1 Current and emerging systems

There are five operators with significant current or planned technology systems:

- Bus Átha Cliath currently has a demonstration RTPI system in operation on the Lucan Rd. corridor. This is based on GPS real-time location relayed to central software which analyses and transmits RTPI to the 20 stops equipped with displays. This is, however, an experimental system and would not form the basis of any system wide scheme. Bus Átha Cliath awaits funding from NDP for any expansion, and it is unclear whether they would fund it from their own resources
- Iarnród Eireann has a substantial system of vehicle location based on its signalling system which is designed primarily for safe train operation rather than arrival prediction. In addition, it has multiple systems of information boards and PA systems covering virtually all stations in the GDA.
- The RPA has included in the Luas design a full RTPI capability with information at stops and in-vehicle. The location technology is based on track/signalling concepts rather than GPS. The RTPI extends to all stops, all vehicles and all services.
- Aircoach currently uses in-vehicle information displays. They are now implementing real-time vehicle location based on GPS supported by GPRS to facilitate operations control. They would like to progress to RTPI at their bus stops, but equally would prefer that the display unit costs were supported. They would assess the business case of self-funding.
- National Radio Cabs use a GPS-based location system to support a real-time dispatching system. The system software allows the booking system to offer jobs to drivers in the immediate area through in-vehicle display units, with a widening search area as required. NTDU is also planning to implement such a system.

E.2.2 Delivery Channels for Static Information (PTI)

The Consultant has identified the following Delivery Channels for Static Information – i.e. conventional PTI:

- Bus Atha Cliath's network of approximately 300 Sales Agents outlets
- Iarnrod Éireann's ticket offices and travel centres
- Information kiosks – e.g. at Dublin Airport
- Tourist offices, hotels, etc.
- Local and national media
- Door-to-door leaflet drops
- Direct marketing to corporate clients

Table E.2 below presents in summary the current and planned infrastructure for PTI and RTPI in the Greater Dublin Area.

E.2.3 Data and Support Services

Table E.3 below presents in summary form by provider:

- Customer Support Services
- Static Information Content (this is distinct from 'channels' in Table E.2)
- Websites and Electronic Media
- Data and Support Systems

Operator	PTI Infrastructure	RTPI System
Bus Átha Cliath	There are approximately 5,500 bus stops for the Bus Atha Cliath networks. Bus Atha Cliath stops are currently owned by the operator, although this is currently the subject of Court proceedings between the company and Dublin City Council About 2,000 of the bus stops have information carousels Approximately 600 bus stops have bus shelters maintained through a 'no cost in exchange for advertising revenue' contract with Adshel. Bus Átha Cliath have a fleet of 1,056 buses as at August 2002	A demonstration RTPI system in operation on the Lucan Rd. corridor. This is based on GPS real-time location relayed to central software which analyses and transmits RTPI to the 20 stops equipped with displays. This is, however, an experimental system and would not form the basis of any system wide scheme. Bus Átha Cliath awaits funding from NDP for any expansion, and it is unclear whether they would fund it from their own resources
Aircoach	There are dedicated bus stops for Aircoach owned by Dublin City Council as Highway Authority (this is the case for all operators according to Dublin CC).	Currently uses in-vehicle information displays. They are now implementing real-time vehicle location based on GPS supported by GPRS to facilitate operations control. Aircoach would like to progress to RTPI at their bus stops, but equally would prefer that the display unit costs were supported. They would assess the business case of self-funding
Other bus services	Bus Éireann, various city tours and several small licensed operators. There are probably close to 6,000 stops in total for the metropolitan area of Dublin	
Iarnród Eireann	Connolly and Heuston Stations have electronic departure and arrival boards in the main concourse All DART and suburban rail stations have information	A substantial system of vehicle location based on its signalling system which is designed primarily for safe train operation rather than arrival prediction. In addition, it has multiple systems of information boards and PA systems

	carriers	covering virtually all stations in the GDA. RTPI is at all DART stations
RPA	All LUAS stops will be fitted with information carriers	Luas design includes a full RTPI capability with information at stops and in-vehicle. The location technology is based on track/signalling concepts rather than GPS. The RTPI extends to all stops, all vehicles and all services.
Taxi Industry	Some taxi ranks in the Dublin area have been fitted with high quality shelters and user information by Dublin City Council	National Radio Cabs has a GPS-based location system to support a real-time dispatching system. The system software allows the booking system to offer jobs to drivers in the immediate area through in-vehicle display units, with a widening search area as required. NTDU is also planning to implement such a system

Table E.2 – Current PTI and RTPI systems / plans in the GDA

Provider	Customer Support Services	Static Information	Websites & Electronic Media	Data and Support Systems
CIE Group	Information desk at Dublin Airport	Printed timetables and brochures for members of the group. Common typefaces used	CIE companies share common website management with each operating companies having its own site. These provide information on networks, routes, timetables, fares, and other relevant user information	Bus Átha Cliath, Iarnród Éireann and Bus Éireann have all timetables stored in databases. However, these are different systems. In each case they drive a number of different systems, including supporting the individual web-based journey planners fro Bus Éireann and Iarnrod Éireann
Bus Átha Cliath	Substantial Customer Service centre which includes a call centre and retail centre at O'Connell Street with a permanent dedicated staff Network of around 300 Sales Agents	Bus-stop carousels, which include timetables, and sometimes fares and ticket options Extensive and sophisticated in-house publishing unit which is capable of producing a wide range of materials, including the carousel materials. Some of the printing is outsourced.	Web site Timetable service but no journey	

Provider	Customer Support Services	Static Information	Websites & Electronic Media	Data and Support Systems
Iarnród Éireann	Travel Centre at Lower Abbey Street which offers a wide range of information services including international services and connections Ticket offices and travel centres	Posters and other display materials are provided at DART, suburban and mainline Iarnrod Éireann stations	Journey planner and some e-commerce facilities for season tickets. New systems including seat reservations under development. Fare query option via email	
Bus Éireann	Travel Centre within Bus Aras		Web site with e-commerce ticket booking facilities. "HAFAS" journey planner is by far the best of CIE group	
Dublin City Council	Provides unidirectional information through VMS and using Traffic FM	Advisory traffic maps are provided by Dublin City Council	Dublin City website offering, among other things, travel and traffic information	Extensive and growing fibre optic network which covers the city centre and the main arteries. As such, it has the potential to act as a common high-volume carrier for a wide range of services, and thus be the core information carrier for the City.

Provider	Customer Support Services	Static Information	Websites & Electronic Media	Data and Support Systems
DTO	Has developed prototype walk and cycle journey planners which have application both on their own, and as supplements to public transport information (e.g. at trip start/end, or for guidance when transferring			Established city mapping and geo-referencing systems Databases of all bus stops (Current actions by DTO will improve the location information and could be used to enhance the Bus Átha Cliath database)
Dublin City Business Assoc.		Dublin visitor maps and guides which include PTI are generated by Dublin City Business Association, as well as other organisations	DubLinks website from end-October which is city oriented and provides map, destination, parking, shopping offers and other information. It is foreseen that it will also include PTI	
National Radio Cabs			Migrating to an interactive cab booking system on the web.	
PAMBO and FOTO		PAMBO and FOTO members generally do not provide printed timetables, since the basis of their operation is normally not licenced scheduled service and hence they cannot legally advertise it as such.		Currently in the process of establishing a database of all transport services offered by its members.

Table E.3 – Current Public Transport Information Service and Systems

E.3 Iarnrod Éireann Customer Information Systems

The existing passenger information display (PID) control system is a GE Harris Harmon and was installed in 97/ 98 please refer to figure 1. The PID control system is located in Iarnrod CTC building at Connolly station. The PID control centre presents train running information to the public via the displays on the station. Typically the train information on the displays includes the following:

- Number of minutes before the arrival of the next train at a station platform.
- Station calling pattern of the specified trains.

Train service information is provided automatically to the station displays via the PID control system. The PID control system obtains train location/ service information from the Vaughan Harmon signalling system.

The passenger information system does not have the full capability of informing customers if the train is late or how late it will be. For example if a train is 10 minutes away from a station and there is a signalling system failure then the system will display it is 10 minutes from the station even if it takes the train 60 minutes to arrive at this location.

The train service time table information is manually typed into the PID control system by system operators. Any changes due to engineering works, service disruptions etc, also have to be manually typed in by the PID system operator.

The major stations on Iarnrod Éireann network have main display boards for departures and arrivals for the various train services. These main displays boards are controlled locally and work on a stand alone basis only. There is no interface between the PID control system and the main station displays.

The train service time table information is manually typed in for the main display boards by the local station staff. Any changes due to engineering works, service disruptions etc, also have to be manually typed in by the station staff.

To date the stations on the following Iarnrod Éireann lines have the capability to display passenger information to travelling customers:

- DART Line: From Howth to Bray.
- South Eastern Surburban Line: Connolly to Kilcoole.
- Northern Suburban Line: All stations Laytown.
- Western Suburban Line: All stations to Maynooth (the display system on this line are still to be commissioned).

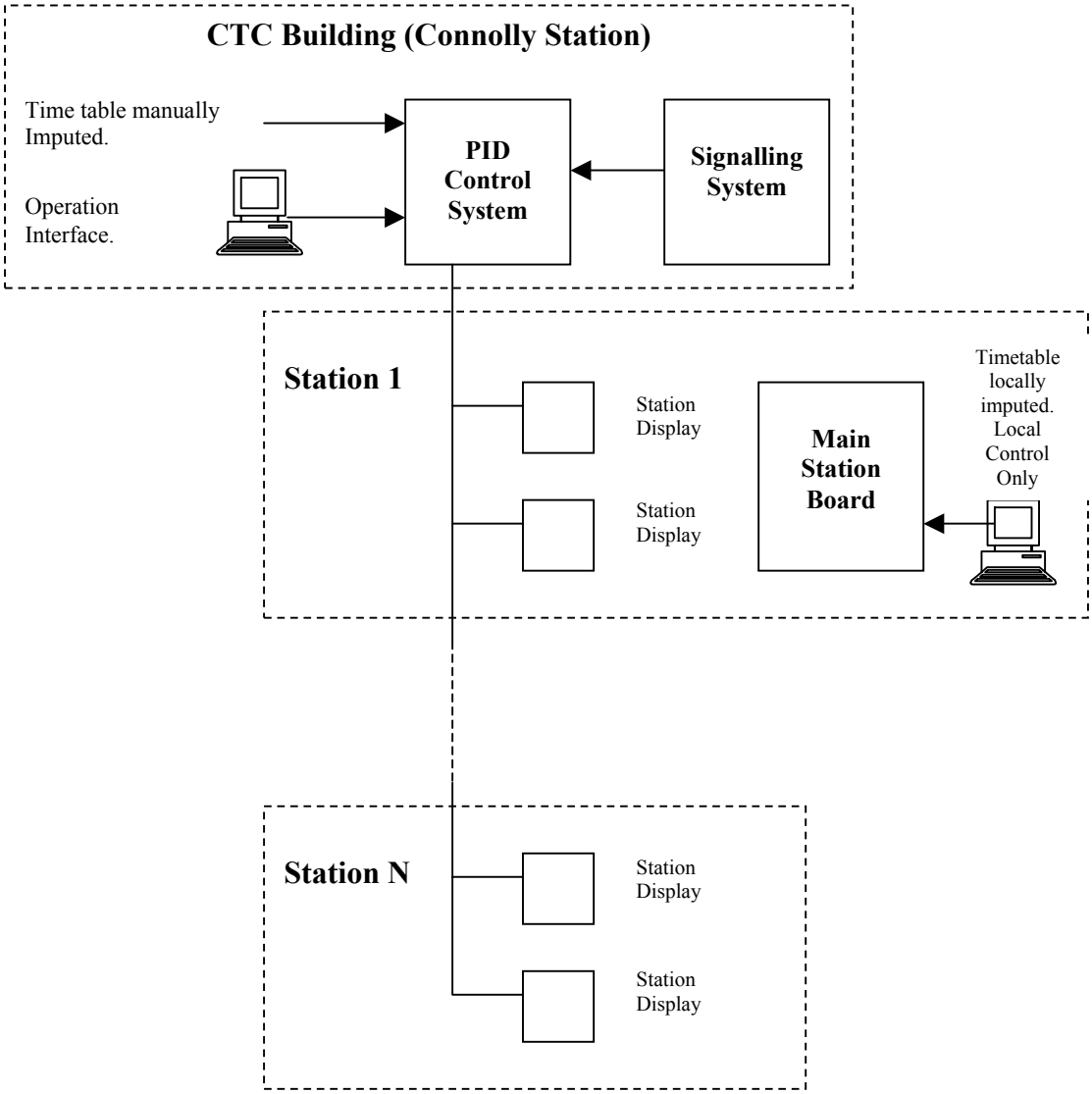


Figure E.1 - Current Iarnrod Éireann Passenger Information Display (PID) system architecture

Existing Public Address Systems

There are two types of public address systems that are utilised for the delivery of information to the travelling customers at stations: -

- Long Line Public Address
- Stand alone station specific public address system.

Long Line Public Address Systems (LLPA)

The long line public address control equipment and announcers console are located in the CTC building at Connolly station. The LLPA equipment was originally supplied by Informat and selectable pre-recorded announcement equipment was provided by Ditra.

The functionality of the LLPA allows the operator to make verbal and selectable pre-recorded announcements to: -

- Individual stations.
- A group of stations.

Generally speaking the operators utilise the LLPA as follows: -

For stations around the Dublin area announcements are made both verbally and pre-recorded announcements are made.

For the remaining stations the announcements are made verbally by the operator.

The LLPA system does not have the facility to make automatic announcements, or interface with the signalling system.

The LLPA systems can make announcements to the stations on the following lines:

- DART Line: From Howth to Bray.
- South Eastern Surburban Line: Connolly to Kilcoole.
- Northern Suburban Line: All stations Drogheda.
- Western Suburban Line: All stations to Maynooth
- Heuston to Kildare .

Stand Alone Public Address System

The remaining stations on the Iarnrod Éireann network have their own stand alone public address systems. At the stations announcements are made to the travelling customers by the local station staff.

Time Table Information

All published timetable information is stored on a Protim database. The database was supplied by Sema (formerly BR Business System). The database can be updated in order to take into account any changes in the timetable train services. The published timetable information can be accessed via the Internet and WAP phones. The status of rail network and train running information can not be accessed via the Internet and WAP phones.

E.4 Brochure issued to Consultees

APPENDIX F

Examples of Organisational Frameworks in Europe

Appendix F:

Examples of Organisational Frameworks in Europe

F.1 Introduction

It is inherent that the political and institutional arrangements define the processes that will govern the running of a RTPI system. It should be noted, however, that re-organisations are normally undertaken to improve the delivery/management of public transport services, generally, of which PTI and Real-time information, are major elements. In this appendix international examples of the institutional arrangements to deliver public transport services generally are provided, with specific reference to their impact on PTI / RTPI.

F.2 Specific examples of arrangements

F2.1 Germany

City and town authorities operate public transport and make decisions on the investment of technology for public transport in the cities. Municipal funding is used to support and develop public transport at this level.

At a regional level additional organisations are responsible for the funding, planning and organisation of public transport. For example 'The Rhein-Main-Verkehrsverbund' (RMV) has ultimate responsibility for interconnections, interoperability and development of timetable systems. Efficient connection of urban systems to inter-urban networks is seen as a priority.

RMV works with the individual transport companies and district and city authorities to offer coordinated bus and train travel from one source. The RMV is not a merger of transport companies. Instead, 11 cities, 15 rural counties and the state of Hessen work together on a voluntary basis and are equal partners.

They are responsible for:

- regional transport planning and infrastructure development
- development of the regional time table for trains and busses
- regional marketing for transport companies
- financial management for the public co-financed infrastructure and service of public transport
- budget planning, controlling and allocation of revenues for transport companies

The individual municipally-owned companies make the decision to implement RTPI. All operators have a duty to supply timetable information to DB, the

national rail company, which works to produce integrated timetabling services between inter-urban and urban public transport services.

F2.2 Spain

The Spanish model consists of public transport authorities that depend on regional governments for funding. The Public Transport Authorities (PTA) have an executive board which consists of members from regional government, central government, municipality of Madrid, other municipalities of the region, private operator association, workers unions and customer associations. The Executive boards are responsible for:

- Planning of public transport infrastructure
- Planning and authorising provision of transport services
- Definition of the ticketing policy and fare framework
- Public transport information marketing and image improvement

Thus in Spain RTPI is provided as a policy decision made by the municipal authority. An RTPI system may be purchased as part of a complete fleet management system.

[Similar arrangements also apply in many parts of France and Italy].

F2.3 The Nordic Countries

There is a general model in operation in the Nordic Countries that requires the relevant local authority to plan all public transport services for a city or region.

This municipal local authority tenders the services; the revenues for which are received by the local authority. The local authority then pays the operator for their services regardless of the number of passengers using the routes, on the basis of the tendered price. This model aims to provide a level of service that has been set from a societal point of view. This 'social need' standpoint has also motivated the request for the provision of journey planners, and on-street and in-vehicle RTPI displays. The municipal local authority takes a view on the quality and content of information required by the user of the services, and also on the information needed to plan and manage the network. The definition of these needs informs the choice of system that is procured.

The local authority requires operators to equip vehicles for RTPI purposes as part of the tendering process. The local authority uses revenues to install and maintain the on-street information equipment.

There are interesting parallels that can be drawn between the evolution of organisational arrangements in these examples and the Greater Dublin Area.

Copenhagen

In 1974, an entity called HT was formed through legislation by amalgamating several municipal bus companies into one. Five counties (the two municipal

authorities of Copenhagen and Frederiksberg, and three other counties, Copenhagen, Roskilde and Frederiksborg) make up the Greater Copenhagen Region (GCR) owned HT.

In July 2000, a new political body was established, called HUR, with the role of supervising the overall multi-modal transport planning for the Greater Copenhagen Region. HUR has an 11-member council, which include the 5 mayors of the counties who were the former owners of the HT company. The Transport Committee of HUR supervises the management of the public transport network in GCR. In 2001, HUR took over 6 local railways, which have now been reorganised into an infrastructure company, HL, and an operating company, Lokalbanen A/S. HUR is the majority shareholder in HL, and is the sole shareholder in Lokalbanen.

The intercity and suburban train services are still owned by Danish State Railways (DSB). Metro is operated by Orestad Development Corporation, co-owned by the State and the municipalities in the two cities. Notwithstanding ownership arrangements, these tracked systems are required to participate in the integrated PTI system managed by HUR. http://www.rejseplanen.dk/

The contractual relationship between HUR and its suppliers is a gross-cost contract with quality incentives. Quality is measured through annual surveys of a customer panel. There are 3 large operators and a number of smaller niche operators supplying HUR with services.

Although route planning and timetabling is the ultimate responsibility of HUR, this function is carried out in close cooperation with operators. This two-way involvement has implications for the way in which the PTI / RTPI system is designed and administered. The three large bus operators use the proprietary HASTUS system for scheduling and timetabling, and this is also used by the PTI function within HUR. HUR can facilitate the transfer of timetable data from spreadsheets compiled by the smaller operators, for whom the purchase of HASTUS was not financially feasible. This information database is the single source of information used by HUR when disseminating PTI / RTPI Copenhagen, through web-based planners, WAP phones, on-street and in-vehicle displays (a current pilot project).

Helsinki

The evolvement of the public transport procurement system in Helsinki closely resembles that in Copenhagen. The Helsinki Metropolitan Area Council, known as YTV, has progressively since 1986 tendered for intercity, regional and intra-city bus services. The first tender for regional services was granted in 1994 and for intra-city services in 1997. The first contracts were for 3 years, nowadays the contract length is 5 years. Contracts are gross – cost, with quality incentives measured on the basis of twice-yearly customer satisfaction surveys. The quality score has over time proved to be sensitive to the quality of the bus fleet, and the ability of the service to keep to timetable. The latter is understandable given the harsh winter climate.

The essential difference between Helsinki and Copenhagen lies in the level of involvement of operators in route planning and timetabling. In Helsinki, YTV solely designs routes and timetables. The timetables are placed as part of the tendering documentation in proprietary Jori software format. This format permits downloading into operators' systems, ranging from other proprietary scheduling systems to spreadsheets. There is a geo-bus stop database maintained by YTV, and there is therefore a common understanding amongst operators of routes, route variant, and bus pole identities.

HKL, the municipal bus company, is now the operator with the second highest market share in the YTV area, and also operates the metropolitan tram system. HKL is currently running an on-street RTPI pilot project, and displays the services of all operators at each bus stop in its project. HKL also has installed RTPI at tram stops, and feeds YTV with real time information on the bus network in the pilot project and the tram network for dissemination in the door-to-door journey planner and on mobile phones.

F.3 Automatic Vehicle Location Systems

It is worth considering international experience with Automatic Vehicle Location (AVL) systems as these are a pre-requisite for the RTPI systems. AVL systems have, at their centre, a tracking device on each vehicle in a fleet. Linking this device to a data transmission system and a mapping system gives the operator the location in real-time of each vehicle, and allows the operator to synthesize this information in an accessible way for customers. The AVL systems when integrated with other vehicle management systems can provide many benefits to passengers, traffic operators and managements of public transport undertakings. On-line information can be consolidated into off-line statistics, which can be mined, if desired, to aid in improving the efficiency of various aspects of the public transport service.

Bain[1] (2002) presented the findings of a survey carried out in 2001 of the AVL experiences of a number of U.S. bus transit agencies (Bain, 2003)., He compared the responses to a previous similar survey carried out in 1995 by the Transit Cooperative Research Program sponsored by the US Federal Transit Administration (Synthesis 24). The initial responses from this 2001 survey of 31 companies present some interesting findings:

AVL System Characteristics

Radio Platform

The radio platforms used by these agencies were divided – almost equally – between a conventional radio system and a trunking one (allowing frequency sharing by dynamic re-use).

[1] *The Use of GPS-Based Automatic Vehicle Location Technologies for Bus Transit: State of the Practice in the USA and Lessons for Elsewhere,* Robert S. Bain, Institute for Transport Studies, University of Leeds, U.K., 2002

Location Technology

The location technology of choice was GPS, most commonly with some form of differential correction. Only two respondents reported the use of odometer-based vehicle location systems; one by itself and the other to augment a GPS system.

Systems Integration

Earlier, in Table 1, the possibilities for the integration of AVL technology with other systems were introduced. The extent of actual systems integration was explored in the questionnaire and the results are presented in Table F.1.

Table F.1: Extent of Systems Integration

AVL Integrated with…	No. of Respondents
Computer-Aided Despatch	16
Schedule Adherence Monitoring	14
Alarms, Cameras, Microphones	1
Automatic Passenger Counters	7
Signal Communications/Priority	1
On-Vehicle Displays/Annunciators	0
Public Information	1

The results in Table F.1 demonstrate that:

- Nearly all respondents employ some form of computer-aided despatch system;
- Nearly all respondents integrate their AVL with their scheduling software (although, answers to subsequent questions revealed that this was mainly for on-line monitoring rather than off-line interrogation, analysis and reporting);
- The extent of integration with other systems is, however, very limited;
- Integration with Automatic Passenger Counters (usually light curtains) was not uncommon however, largely due to cost constraints, transit agencies typically install counters only on a sample (generally around 10%) of their fleet;
- Only one agency used AVL for signal priority purposes (the Napa County Transportation Planning Agency – the smallest fleet operator from the survey);
- Only one agency used AVL for real-time information purposes (the Regional Transportation District in Denver). Their website is at: http://www.rtd-denver.com where details can be found of a programme to

receive bus information in a wireless PDA. They also provide real-time information to kiosks located throughout the city.

Bain noted that:

> *Most of the comments received regarding evaluation were 'soft' and largely anecdotal. Evaluation concentrated on inputs (such as the percentage of the fleet that could be monitored in real time) rather than outputs (such as service reliability improvements). Passenger opinion surveys were mentioned by none of the respondents.*
>
> *This is not to say that transit agencies did not benefit from the technology, sometimes significantly. "Enhanced operator safety", "Much reduced radio traffic" and "Improved complaints procedures" are undoubtedly benefits however the fact remains that few agencies have wanted to, needed to or even could explore the full functionality of their systems in areas such as detailed analysis of actual versus scheduled running times. As such, rigorous evaluation of AVL systems has not been a priority for North American transit agencies.*

Bain concludes that:

> *A comparison of results from the two AVL surveys, conducted six years apart, suggests both good and bad news for the transit industry. On the one hand there appear to be fewer procurement problems as agencies learn what can and can not be achieved given certain budgets. Vendors, those that remain, are also more experienced and their products have undoubtedly benefited from the rigours of day-to-day use and feedback from early adopters. Systems integration, although still a complex undertaking, is less plagued by the challenges of getting different sub-systems to communicate effectively with each other. GPS accuracy has improved and related costs continue to fall. Furthermore, software development appears to have overcome many of its early problems.*
>
> *The evidence from the 2001 survey suggests that the collection and use of the AVL data itself continues to be the major constraint in terms of extracting the full potential from an AVL system.*

F.4 Further Information

European Metropolitan Transport Association (EMTA) groups together approximately 30 authorities responsible for public transport networks in large European cities. The Dublin Transportation Office has been a member of EMTA since 1995. More information on this association and the work carried out is available from the www.emta.com

The EU project ISOTOPE carried out comprehensive assessments of organisational forms during 1995 and 1997. The project described and compared existing legal status and organisational structures for urban public

transport areas. The project also aimed to develop a strategic approach to the development of urban public transport operations. More information on this project can be found on the Community Research and Development Information Service (CORDIS) website at: http://www.cordis.lu/transport/src/isotope.htm

During 1999 and 2000 a 'CODE taskforce' was assigned with the task of looking at the different RTPI implementations that had been occurring in different European cities.

The CODE project addressed key questions related to the implementation of Real-Time Passenger Information and put forward recommendations and Guidelines for the implementation of real-time Information projects.

The report 'Guidelines for implementing real-time information projects for city-wide public transport' is available from the CORDIS website at: http://www.cordis.lu/telematics/tap_transport/library/code_real_time_info.html