RTIG

UK Real Time Information Group

Guidelines: Project Management of the Implementation of an RTI System

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1 Background

1.1 This document

1.1.1 This document has been prepared by RTIG under the direction of the RTIG Executive Member for Guidelines. It offers advice and guidance for RTIG members on the successful management of an RTI implementation project, based on the experience of recent projects, and covers:

- Planning (section 2);
- Finance (section 3);
- Procurement (section 4);
- Agreements (section 5);
- On-bus equipment (section 6);
- At-stop equipment (section 7);
- Internet, SMS and telephone services (section 8);
- Operator personnel (section 9);
- Communications (section 10);
- Data (section 11);
- Project closure and on-going systems management (section 12).

1.1.2 This document will be kept under review, and feedback from RTIG members is welcomed on any of the points raised or on any additional points that should be included.

1.2 Background

1.2.1 One of the key aims of RTIG is to promote, improve and increase the delivery of RTI to passengers and fleet managers on local bus services throughout the UK. Part of RTIG's overall remit is to reduce barriers to implementation by offering support and advice to its members of the various aspects of implementation. It does this through a number of mechanisms, by developing technical standards, hosting workshops, providing a national voice for RTI stakeholders and through the development of guideline documentation.

1.2.2 This document offers best practise guidance on the successful project management of an RTI implementation project, in particular from a local authority or bus operator project officer perspective. It has been produced with input and comment from the three principal types of members within RTIG, namely:

- local authorities and public transport executives;
- bus operators;
- RTI system suppliers.

1.2.3 It has also incorporated information captured during DfT's Transport Direct programme which helped fund 19 RTI systems across England.

1.2.4 The authors would particularly like to thank Melanie Alexander (TfL), Ian Mathie (Edinburgh City Council) and Keith Tompson (Acis) for their extensive review and contribution to these guidelines.

1.3 Status

1.3.1 This is a document is a **first full issue** approved by the Executive of RTIG for release to members.

2 Planning

2.1 Introduction

2.1.1 RTI projects often involve balancing a complex mix of high-level stakeholder requirements and the need to understand technical detail. Careful planning, therefore, plays a critical part in the success of any implementation project. This section introduces some of the areas that require planning before commencing your RTI implementation and how a project manager may go about approaching some of the multi-faceted aspects of any implementation.

2.2 Scoping the project

2.2.1 Initially a project may develop from either an operator or an authority identifying a business need to be fulfilled. If, at an early stage, another key stakeholder is identified, they should be engaged as soon as possible, preferably during preliminary discussions prior to the project taking further shape.

2.2.2 Scoping of the project should be done in partnership with stakeholders and may be assisted by reference to any neighbouring systems and plans, other established systems, and RTIG functional documentation. Establishing an achievable scope that delivers the business objectives will be a major factor in the ultimate success of the project.

2.2.3 The business requirements will need to be determined for each stakeholder. As stakeholders will have different business objectives it may be useful to clearly identify the measure of success for the project from the perspective of each stakeholder. It should be made clear as to what are necessary requirements for the project compared with other items that could be provided through future development.

2.3 Determining the stakeholders together with their role and remit

2.3.1 It is worthwhile documenting who the stakeholders actually are and which specific roles and responsibilities each shall hold. Whilst there is always likely to be a local authority, a bus operator and a system supplier involved, there may also be a communications company, a consultancy, a development company etc who has also bought into developing the system.

2.3.2 One of the largest initial challenges to the project is normally the selection of suppliers. User stakeholders (local authority, operators, any development company, passenger groups, etc) may gain much coherence from working together to agree the mechanisms and criteria for this selection.

2.3.3 Trust must be nurtured between the stakeholders at an early stage in the project. Seemingly small matters, like showing all the stakeholders logos on the same piece of paper, will help to encourage unity within the project.

2.4 Formalising project management processes

2.4.1 Once stakeholders have been identified and roles defined, a list of the key personnel and their authority to make decisions within each stakeholder is useful with their contact details and likely involvement in the project.

2.4.2 At this stage it will be possible to start formalising project management processes within the project. This may include the formation of a project board with stakeholder members. Each board member should each have defined responsibilities and remit. Management processes and reporting should be declared. This may include the creation of issues and risks logs and a review of enablers and blockers may highlight areas to be addressed during the project.

2.4.3 Some individuals may represent a risk to the project due to their 'approach'. Such individuals should be identified and their cooperation gained through persuasive reasoning at an early stage.

2.5 Skills and resource audit

2.5.1 Once the stakeholders and key personnel have been identified it is useful to determine who is capable of doing what. Skill gaps may be identified and technical assistance or management assistance in specific areas may be brought in from elsewhere to the project. At this stage, the requirement for any consultancy services may be identified.

2.6 Use of consultants

2.6.1 When selecting consultants, it is important to consider the experience that an individual or organisation will bring to a project and to develop a clear remit of what they are expected to contribute. The role of the consultant within the project should be clear. Are they being employed merely for technical guidance or as a project manager?

2.6.2 The 'approach' of a consultant is equally important. For instance, the consultant should be capable of working with each of the stakeholders and seeking consensus on difficult decisions. A good consultant can be invaluable in building trust among stakeholders.

2.6.3 No consultant will hold 'perfect knowledge' and it may be worthwhile pursuing alternative points of view from contacts in the industry or other consultants. However, this needs to be done openly, or you may risk damaging the project. If you don't trust your consultant to do his job, there is little point in having him/her.

2.7 Architecture

2.7.1 When developing an architecture for your RTI system, it will be useful to give consideration to the architectures of other RTI systems that have already delivered and how effective they are. A stakeholder should be tasked with gathering this information and presenting it in a clear unbiased manner. RTIG has produced an architecture document; this is a recommended place to start.

2.7.2 A successful architecture will have to accommodate many different types of concerns. These may include issues with integrating neighbouring systems, and mismatches between bus operating areas and local authority boundaries.

2.7.3 Once complete it should represented diagrammatically to allow all parties to understand what will be achieved by the roll-out of the system and offer a transparent picture of how the separate components of the system will be connected. Before agreeing a final architecture for your project, it is important to understand the cost structures associated with providing different architectures and whether they suit your particular funding model (see section 3).

3 Finance

3.1 Introduction

3.1.1 Getting any RTI system off the ground often requires significant capital expenditure from project sponsors. In addition, longer term considerations, such as the maintenance and the management of the system, will also need to be accommodated into any successful financial model. This section discusses different types of financial models and which funding sources are likely to fulfil different roles most adequately.

3.2 Funding models

3.2.1 In general, the availability of funds will differ across stakeholders and will be dependent on the strength of business case. Possible funding models will be determined partly from what each stakeholder stands to gain from a project.

3.2.2 Due to the availability of different types of funds, many RTI partnerships have opted for a financial model where the local authority picks up the majority of the capital costs of a project and the operator covers the majority of revenue costs.

3.2.3 Other partnerships have split costs depending on natural "ownership" of parts of the system. It may be worth discussing different divisions on the capital costs of different system components (on-bus, depot or central system) or of revenue funding for data radio and voice radio.

3.3 Public funding

3.3.1 In the past local authorities have often gained funding for their part of an RTI system from the following sources:

- Urban Bus Challenge;
- Rural Bus Challenge;
- LTP Funding;
- Section 106 funding;
- other government initiatives.

3.4 Operator funding

3.4.1 The scale of operator funding will often depend on what the operator stands to gain from such a project. This will usually be defined in terms of possible patronage gain or operational efficiencies that can be achieved. If this is the case, the mechanism for the measurement of these potential benefits should be considered. Conducting 'before and after' surveys on items such as the success of bus priority or customer perception can help with the development of an operator's business case.

3.4.2 Bus operators often have many different priorities in funding improvements to any service; RTI often competes with other potential improvements, such as the upgrading fleets. Currently, the business case for delivering increased passenger numbers is not as clear for RTI. Therefore, at present, the greatest opportunity for an operator to construct a business case lies in the ability of an RTI system to improve reliability or enhance safety through improved control, communications and collection of historical data.

3.5 Project scalability and expansion

3.5.1 Although the implementation of an RTI system often involves the outlay of significant capital, most systems are scaleable and therefore investment may be spread over many phases. It is not uncommon for local authorities to take a corridor by corridor approach to rollout. However a bus operator may find this causes problems with fleet management and may consequently prefer to equip a whole fleet in one go.

3.5.2 For a project to be financially viable, a project lifespan of between 5 to 15 years is often required. Whilst funding may have been secured for the 'kick-off' phase of a project, it is only likely that a project will be successful if a critical mass of buses can be fitted thus enabling sufficient coverage of RTI over a given area.

3.5.3 Securing the funds for extension of projects may well depend on how well the first phase of a project has been executed, how well stakeholders have worked together, and what benefits have been achieved by the user. It is therefore important that the planning and management of any RTI project is competently performed.

4 Procurement

4.1 Introduction

4.1.1 Procurement of an RTI system is often a complex process which involves multiple stakeholders and the development and review of sometimes complex technical documentation. In fact, the procurement process can be considered a project in itself. This section outlines the processes to be undertaken during the procurement stage and how good project management can smooth this sometimes difficult procedure.

4.2 Procurement process

4.2.1 Selection of a procurement pathway will depend on the level of financial input from each stakeholder. Ideally, procurement methods will be agreed with both local authorities and bus operators working in unison. Distrust between stakeholders represents a significant risk to any project, particularly during the procurement stage.

4.2.2 Undertaking a joint procurement alleviates many potential issues that may be encountered by each stakeholder procuring individual parts of the system. If separate procurement pathways are taken then the architecture should be reviewed to ensure issues of shared components are identified and understood by all. It is important that any resulting requirements and responsibilities for integration are identified at this stage.

4.3 Specification compilation

4.3.1 If stakeholders have chosen the simple option of procurement through one single specification, compilation should involve all stakeholders from the start. Some tips are as follows:

- one stakeholder could take responsibility for coordinating formulation of a specification but seek the detail for specific sections from appropriate stakeholders, for instance operator requirements;
- to minimise the length of the process, stakeholders should be given the opportunity to comment within a given timeframe and a first draft 'discussion document' produced at an early stage. Several different versions will likely be created before it is finally issued;
- if possible the specification should define the requirements rather than the implementation methodology. This allows flexibility in the delivery, innovation or alternative approaches;
- appendices can be produced specifically relating to each stakeholder to ensure that everyone's requirements are catered for;
- the specification can form the basis of a 'call off contract' from which each stakeholder can have a separate contractual relationship with the chosen supplier;
- clear system performance criteria and targets should be defined within a specification. A penalty and reward regime could be considered.

4.4 Choice of Supplier

4.4.1 Different projects will have different priorities in terms of the functionality desired. Within tender bids, suppliers will describe as to what they have delivered to date in other systems. It is often beneficial for stakeholders to take the effort to see examples of working systems from each short-listed bidder before making a choice. This will give them a better understanding of what they may be purchasing. The opportunity should be taken on visits to speak to authority and operator personnel that use the system to understand how the system works in practice.

4.4.2 Some tips on how to evaluate tenders are as follows:

- evaluation of a tender is best performed by grading strictly against specific criteria, for instance project management and delivery, systems functionality, system maintenance etc;
- if a bid comes from a consortium, care should be taken to understand how the consortium will operate to deliver all aspects of the project;
- a defined set of tests should be undertaken during site visits to clarify issues that are unclear in tender submissions;
- evaluators should be realistic on assessing risks when an aspect of system is said to be 'under development'.

4.5 Following award of contract to the chosen supplier

4.5.1 For many implementations, the awarding of the contract to the successful system supplier(s) represents the closure of the first phase of managing an RTI implementation. Before commencing with installation, it is well worth reviewing the management processes for the project, because a key new stakeholder (the supplier) has been brought into the project. The review should include:

- the method for convening, chairing and inviting people to project meetings;
- the extent of delegated authority to the project manager;
- key milestones and measurement of project delivery;
- escalation routes and expected actions;
- change control procedure;
- the review processes for identified risks and issues.

4.5.2 Following management review, it may well be appropriate to perform a detailed review of the project prior to the start on any works. This should include a 'due diligence' exercise to identify clearly and openly what is required from each stakeholder and how they intend to deliver these in line with the plan. In addition, if not already set, the acceptance criteria (FAT & SAT) should be established at this stage in the project.

4.5.3 Long lead time items should be reviewed as part of this process. These may include:

- date sources and availability;
- features requiring development;
- bus deliveries;
- shelter installations;
- permissions for radio base stations;
- obtaining electricity for bus stops.

5 Agreements

5.1 Introduction

5.1.1 Written agreements can help reduce the potential for friction between stakeholders in any RTI partnership. This section describes some of those issues and suggests some approaches to negotiations.

5.2 Data sharing agreements

5.2.1 Consensus should be sought on the contents of a data sharing agreement at an early stage of a project as possible. RTIG has produced guidelines for the drafting of agreements and has released some sample agreements for its members.

5.2.2 The agreement may need to involve the system supplier, particularly if 'electronic' controls are to be used. If this is the case, it may be necessary to include an outline of the intended agreement in the system specification.

5.2.3 Some operators will be nervous about sharing reliability data with a local authority. To reassure operators, an agreement could stipulate whether AVL (Automated Vehicle Location) data may be released to third parties or not. Operators will often wish to restrict these third party rights. One approach is to restrict the dissemination of customer prediction information (web or SMS) separately from raw AVL data. A robust RTI system will not allow separate operators to view another operator's services on their terminal and operators should be comforted as such.

5.2.4 Stakeholders should consider the 'spirit' of any data sharing agreements. For instance, the procedures for interacting with the Traffic Commissioners are particularly sensitive, and poor practice can destroy trust.

5.3 Stakeholder agreements

5.3.1 Once responsibilities have been assigned, it is important to document any decisions made and procedures determined in the initial stages of the project. Whilst a project may have a life of 5 to 15 years, individuals working for the various stakeholders will move on and continuity needs to be ensured within a stakeholder agreement.

5.3.2 A stakeholder agreement can be produced to summarise roles and responsibilities and can include sub-documents on data sharing, maintenance, installation, and day-to-day operations. This is important as one stakeholder's business outcome may be dependent on another stakeholder. A stakeholder agreement need not be a static document; ideally such a document will evolve over the life of the project as priorities change and new challenges emerge.

6 On bus equipment

6.1 Introduction

6.1.1 The fitting of bus equipment requires the cooperation of local authority, bus operator and supplier stakeholders. This section covers how the fitting process should be undertaken and what steps should be carried out to make this process as smooth as possible.

6.2 Installation method

6.2.1 Whether the local authority or the bus operator is managing installation, the fleet engineering manager should be consulted within the bus company and should be reassured that installation of any equipment associated with an RTI system will not impact on the performance of any existing on bus systems. For each depot to be equipped a nominated contact person should be identified to which all queries can be addressed.

6.2.2 Fleets often comprise different types of buses; therefore a trial installation should be undertaken on each vehicle type to agree installation methodology. This should be documented for every vehicle type as this provides a useful guide for sub-contractors and helps avoid unnecessary errors.

6.2.3 A system should be developed whereby an operator can record and approve the installation on a bus by bus basis. In the event that new buses are to be provided with pre-wiring for an RTI system, the above diagrams will represent a useful guide for the manufacturer.

6.3 Installation programme

6.3.1 Different operators will be suited to different types of programmes for installation. In defining a suitable installation programme, the following needs to be considered by local authority, bus operator and supplier stakeholders:

- how much resource does each stakeholder need to allocate to installation – for example how long does it take to fit one bus?
- can buses be fitted in the daytime – are buses scheduled to return to the depot between the peak times?
- can buses be fitted at night?
- what other restrictions are there on installation?
- is there room in the depot for installation once buses are parked?
- how many buses can an operator release per day if the operator is able to release vehicles?
- how are buses verified and accepted as installed?
- how is the register of the location and status of fitted buses to be maintained?
- is any infrastructure required at particular depots (particularly for double deck buses)?

6.3.2 It is frustrating for all parties for a local fleet to be fitted, only to be redeployed elsewhere in the country or replaced by newer vehicles. This imposes removal and refit costs on operators, and risks disrupting both local fleet management and passenger information services. Prior to fitting buses, it is well worth gaining an understanding of what the operators plans for fleet movements or renewals are.

7 At-stop equipment

7.1 Introduction

7.1.1 Most RTI systems have some form of on-street signage that delivers information to the public. This section identifies some of the pitfalls in this area and makes recommendations of how to avoid them.

7.2 System integrity

7.2.1 There will often be pressure for stakeholders to deliver visible RTI as soon as possible. However, in order to realise the full benefits of providing real time information to the public, the system should be fully proven before signs go live. From the public perspective, success or failure of a system may be determined in its first few weeks: if teething problems are regularly occurring, public confidence in the systems will be greatly diminished.

7.2.2 If on-street signs are to communicate with base stations via radio links, it is important to undertake a radio survey at each stop location to ensure that there is a good signal between sign and base station prior to installation. If not, alternative communications will need to be sought.

7.2.3 Finally, it will ease the creation of the data if all displays are configured to show the names in a standard form. There are a variety of standard approaches and guidelines for good practice applying in areas such as stop numbering, at-stop display conventions, website presentation and text services, but much will still be left to the individual implementer to determine.

7.3 Equipping shelters

7.3.1 RTI systems typically have some form of on-street signage to inform passengers of updated bus times. Installation of a system may mean fitting signs to existing bus shelters or the provision of new shelters. Implementers may experience difficulties in this area depending on the company, local contracts and local circumstances.

7.3.2 As with buses, shelters often vary in design; therefore fitting signs may be complicated by needing different brackets and head clearance depending on individual shelters. Clear specification of the shelter requirements for RTI is useful for elevating these problems and for helping to make the supplier aware of the differences in any shelter designs. Specifications should cover:

- electrical facilities for RTI (which may be separate from other purposes);
- physical footprint, fittings and brackets for RTI signs;
- the need to ensure that sufficient headroom will be maintained following installation of RTI signs.

7.3.3 Bear in mind that new or project specific shelters may take dramatically longer to produce and deliver than older or more commonplace shelter designs.

7.3.4 A commonplace problem experienced by implementers is getting electricity supplies to shelters to power RTI signs. This is often a lengthy process and no generic solution to speed up this process has been identified. It is therefore prudent to order power supplies at soon as possible.

7.4 Pole-mounted units

7.4.1 In areas where use of shelters is difficult, externally mounting a display on a pole should be given consideration. One significant benefit of this is the information can be more visible to the public as it can be clearly seen by passers-by and car drivers.

7.4.2 Prior to installation, it will of course be necessary to ensure there are no utility pipes or cables in the pavement that would obstruct the installation of the pole.

7.4.3 Solar powered signs are now becoming available and their use eliminates most of the electrical supply issues – particularly in rural areas where supply may be difficult and costly.

8 Internet, SMS and telephone services

8.1 Introduction

8.1.1 As new technologies become available, many RTI partnerships have opted for delivery of RTI to the public through web, SMS and telephone services. Generally, these can be used to deliver RTI to a wide audience without the high levels of cost associated with installing at-stop signs. This section describes some of considerations project stakeholders should address when setting up such services.

8.2 Internet

8.2.1 The internet offers the opportunity to deliver more personalised services directly to the traveller. This allows the traveller to receive RTI prior to travelling and helps them have a smoother journey with less waiting. Internet based RTI can be picked up whilst on the move, through WAP, 3G phones, PDAs and kiosks. Also, the Transport Direct portal website links to local websites containing RTI, helping to achieve a national audience.

8.2.2 Relatively speaking, websites can be comparatively cheap to set up and maintain. In an RTI project, websites may be hosted by the local authority, bus operator or supplier or a combination of all three. In each case, consideration should be given to site design by all stakeholders, including which logos the site should bear.

8.3 SMS

8.3.1 The rapid increase in the use of text services on mobile phones provides an ideal platform to deliver RTI directly to the traveller. Many RTI partnerships have found that SMS services allow them to cover many more stops than comparatively expensive at-stop signs.

8.3.2 When setting up an SMS systems, stakeholders should consider:

- cost to the customer;
- publicising the service;
- numbering of bus stops (national numbering system based on NaPTAN is now in place for SMS codes for individual bus stops);
- the different services to be contained within each text (eg if a number of different services depart form the same stop, does a user get details of one route or the next three departure irrespective of route number).

8.4 Telephone services

8.4.1 RTI can also be delivered to the public over the telephone. To date, this has generally been done through the expansion of an existing timetable-based telephone support service.

9 Operator personnel

9.1 Introduction

9.1.1 In order to ensure buy-in and confidence in the RTI system to be installed, it is essential that key personnel from the bus operators are aware of what the project is aiming to achieve and are consulted to ensure that their needs are addressed. This section details some of these personnel and why and how they should be approached.

9.2 Consultation

9.2.1 The role of any consultation process is to ask people what they would like before telling them what they are going to get. Chances are, the two will end up being the same but the approach can make the world of difference to the people that will make the system a success or failure. Some of the personnel to be consulted on the operator side may include:

- service controllers, on the sort of tools they would like to help them do their jobs better;
- service planners, on how they would like data presented in order to help them plan their schedules better;
- drivers and trade unions, to ensure that they 'buy into' the system being procured.

9.2.2 Consultation shouldn't be left to the last minute, but handled openly at an early stage.

9.3 Training and communication with drivers

9.3.1 Bus drivers will be day-to-day users of the RTI system and to the public often the first point of contact about it. Consultation and keeping them up to date with the project essential. Drivers will appreciate any written literature given to them about the system, for instance production of user guides for any equipment the drivers may have to use.

9.3.2 Drivers sometimes have concerns about a 'spy in the cab'. The opportunity should be taken to sell to them benefits of the system for instance information on schedule adherence, better assistance in case of emergency, improved voice etc.

9.3.3 Drivers should be trained how to use the system. This will alleviate many difficulties such as drivers not logging on to the system properly. Drivers are the front line of any RTI system and are likely to be the first to spot any failures or problems as they arise; it is important that they are content and confident with the system so that reporting of faults is a smooth process.

10 Communications

10.1 Introduction

10.1.1 Communications is often an issue that causes concern amongst implementers of RTI systems. This is partly due to the complexity of some of the technology involved, partly due to the increasing choice in the marketplace and partly due to frequently changing price structures which may alter business cases.

10.1.2 This section covers the two principal types of networks used in RTI systems and the issues surrounding their use.

10.2 PMR

10.2.1 PMR (Private Mobile Radio) networks have been traditionally used in RTI systems and remain the most common communications system for transmitting RTI data. Part of the reason why PMR networks are popular is that once installed they require little ongoing revenue to maintain them. As with all communications choices, stakeholders should look to fully understand installation and ongoing costs at an early stage in the project

10.2.2 Whether installing a new system or expanding a system that is in place, implementers may experience delays in obtaining planning permissions for the installation masts, even when using an existing mast site. It is therefore recommended that the communications network is considered at an early stage within the project, including identifications of mast sites and early submission for permissions.

10.2.3 Some other issues to consider when selecting PMR network:

- radio coverage needs to be sufficient at the available frequencies around the routes. This may be particularly problematic in hilly regions and needs specialist expertise;
- it is possible to share PMR with other local public sector organisations (such as the police or traffic managers), but this can be time consuming activity;
- with a PMR system, there may be an incentive for an operator to have more buses fitted with AVL given the reduction in communications costs per bus that can be achieved;
- procurement of a voice and data services may enable an operator to save his existing voice radio communications costs and improve the quality of communications afforded to its drivers;
- bus services that roam outside of the PMR network boundaries may not be able to directly communicate is the control centre base.

10.3 GPRS

10.3.1 Use of the public GPRS (General Packet Radio Service) networks represents an increasingly realistic option for use within RTI systems, due to a mixture of improving technology and falling prices for data transmission. A significant advantage is that GPRS systems are national and providing there is sufficient coverage, the issue of a bus roaming outside of a network should not arise.

10.3.2 Unlike PMR, GPRS is not under the project control and ensuring network availability becomes a real issue. GPRS providers are reluctant to provide quality of service guarantees. Some points for consideration when entering a service provision contract include:

- Is there sufficient coverage in the area for the RTI system? If not, who will pay for any required upgrade?
- If communications are being utilised for provision of voice communications, how, if possible, will 'Emergency Calls' be prioritised?
- Are other communications requirements (eg group calls) addressed?
- How will ongoing revenue costs of the network provision to be shared out?
- Will the costs for data transmission focused on individual buses or will they be shared on a fleet wide basis?

10.3.3 RTIG has been negotiating with a range of communications service providers with a view to arranging one or more national framework agreements. Because of RTIG's national standing, this may offer implementers an improvement in value for money when they approach service providers.

10.4 Newer communications technologies

10.4.1 As with all innovative areas, communications technology is rapidly advancing. Stakeholders may wish to examine how less conventional methods can be incorporated into their system to help to deliver their requirements.

10.4.2 An example of this is the use of 'wireless fidelity' (Wi-Fi) networks in RTI systems. The term Wi-Fi is used generically to refer to any type of wireless network based on the IEEE802.11 protocol series, which is aimed at short range, high capacity links. These can be used to upload and download information to and from buses and control centres in depots. Wi-Fi can be used in a 'mesh' architecture to create a virtual network from buses to other buses and signs to return the data back to a small number of fixed point links.

10.4.3 Communications is a specialist subject and expert guidance is valuable. However the normal rules of project management apply: weigh the benefits against the costs and risks before proceeding.

11 Data

11.1 Introduction

11.1.1 The accuracy and integrity of data will directly impact on system performance. It is important not to under-estimate the time and resource required to get the necessary data streams in place for an RTI system. This section describes some of the more commonplace issues encountered when tackling data issues.

11.2 Data integrity

11.2.1 It is essential that the way data flows round the system and between organisations is understood by all. This should be represented diagrammatically to stakeholders. At the same time it should be agreed who is responsible for passing what data to whom, when data changes, and who authorises and checks any changes.

11.2.2 It is important that the outputs required are reviewed at the same time as the data availability is reviewed. For example, if an operator wishes to review the schedule adherence of running boards, running boards data must be available to the AVL package.

11.2.3 Primary data sources should be used where possible, as secondary data sources may have been created using manual data entry and may be susceptible to human error. You may wish to consider taking schedule information direct from the bus companies planning tool.

11.2.4 Information is often used from local authority bus stop databases. The accuracy of this data will need to be checked as well as how regularly updates have been performed. Stop information for each route on an RTI system should be checked and corrected if necessary. A review of an RTI system may catalyse a review of a range of other systems in use by a local authority or an operator.

11.2.5 When considering data integrity, consider the following:

- How robust, reliable and complete are the data sources?
- How does data get checked and what automated checks can be conducted on the data prior to commissioning?
- What checks can be made during operation and who does them?
- What level of inaccuracy is acceptable to the system?
- How often does the data change or need to be updated?

11.3 Manual input

11.3.1 Manual inputting is a time-consuming task, susceptible to human error; however, there may not be a ready-to-use fully automatic data feed from the outset of the project. The level of detail of data required for an RTI system will differ according to supplier and this will have a direct impact on the level of resource required for the task. Therefore, it is important to determine how much data needs to be manually inputted and how long will this take.

11.3.2 Project stakeholders need to consider who is to be responsible for inputting data. The operator will likely hold the majority of information that needs to be entered. If the local authority is to be inputting the data, the operator must fully assist to ensure they have up to date, accurate information. Operators should make time to check that accurate information has been input as it is their drivers and passengers to whom this information is to be transmitted.

11.3.3 One of the few benefits of manual inputting is the understanding of the data structure that the user gains. This proves invaluable when troubleshooting at a latter date in order to rectify possible errors in the data.

11.4 Automated data feeds

11.4.1 All projects should explore the means by which an automatic data feed can be provided because of the potential reduction in labour this requires; however automated systems are not always easy to use and can often be expensive.

11.4.2 Awareness should be gained of national initiatives such as TransXChange. When the national schema becomes available, it will useful to understand how easy it will be to adapt to your current system and the costs that will be incurred in adopting its use.

11.4.3 If a direct data feed is being considered, how 'automatic' will this feed actually be? If it takes as much time checking data as it took inputting data, the 'automatic' feed might not represent value for money.

11.4.4 Always remember that any data feed can only be as good as the data it is feeding. An automated data feed speeds the transfer of data but does not validate the completeness or the accuracy of what is transferred.

12 Project closure and on-going systems management

12.1 Introduction

12.1.1 Closure of a project involves several stages. These include the testing and any formal evaluation of the system. This section details closure of an RTI implementation project and the on-going management of the RTI system.

12.2 FAT and SAT tests and sign off of system

12.2.1 FATs (Factory Acceptance Tests) and SATs (Site Acceptance Tests) are important procedures and usually have a formal contractual impact as well as allowing a supplier to achieve financial closure. It is recommended that the authority for FAT and SAT is clearly within the project plan and FAT and SAT criteria should be detailed within the tender specification. As this stage represents the delivery of business deliverable, all stakeholders should be considered.

12.2.2 Delays to FAT and SAT may be experienced as equipment may not be in place or as more is added previously working parts of the system may no longer do so. Also, as RTI systems are increasingly IT based, implementers may experience issues with software upgrades and installations.

12.3 Project evaluation

12.3.1 All stakeholders of any RTI project should be interested in the measured benefits from the system. An evaluation process should be identified at the early stages of the project. This should include clearly identified benefits that the stakeholders desire to be monitored; this will help ensure that any required "before" data is identified and captured.

12.3.2 RTIG has published documents on how a project may wish to go about measuring the benefits. The approaches used include:

- measuring patronage and revenue figures over time;
- conducting before and after surveys on the general public to measure perceived improvement to services;
- conducting before and after surveys of operation managers and bus drivers to measure the improvement in bus operations;
- obtaining information from RTI suppliers (eg SMS or internet site hit rates).

12.4 On-going management of the system

12.4.1 Implementation is not an instant process, and one of the more difficult periods is likely to be when some equipment is deployed, some being installed, and some still to be delivered. The management of the project through this phase will be critical to the perception of the project by operational users and the public alike.

12.4.2 In many cases, a phased approach will be taken. A close relationship between project manager and the ongoing management (including aspects such as marketing) will need to be arranged.

12.4.3 Once the implementation project is formally closed after completion of FAT and SAT tests, the RTI system now moves into operational mode and a new management structure will be required to accommodate this, even if personnel remain the same. At the very least, stakeholders (local authority, bus operator and supplier) should identify of roles and responsibilities for the on-going management of the system including who will be in charge and who and will manage day to day operations. Responsibility for the ongoing operation of the system should be clear amongst the stakeholders and stakeholders must consider how they wish to continue to be engaged.

12.4.4 Areas which need to be considered include:

- maintenance of data sets and flows;
- vehicle transfers;
- review of system performance:
  - How is this measured, service availability and accuracy?
  - What remedial action is possible?
  - Who does the remedial action and pays who pays for it?
- management of communications infrastructure/contracts;
- review and delivery of business benefits;
- resolving snag list issues from SAT;
- cleaning of displays;
- maintenance of the hardware and components should be considered:
  - Who is responsible for maintaining what equipment?
  - Is this contracted to a third party if so how is this funded and who manages and reviews this contract?
  - How is performance to the contract measured?

12.4.5 Some of these will be handled best by local authorities, some by bus operators and some by the system supplier.