List of contents

1 Introduction 2
2 Planning 6
3 Design and Implementation 13
4 Operation and Maintenance 17
5 Costs 19
6 Performance 21
7 Glossary 24
1 Introduction

This document summarises the “lessons learnt” from implementing Urban Traffic Management and Control (UTMC) systems at the UTMC showcase demonstrator in Preston. Its aim is to assist Local Authority managers, engineers and key decision makers planning to implement UTMC systems, by drawing attention to the issues that surround this type of system. Both positive and negative issues have been highlighted in order to give a balanced view of Urban ITS implementation.

The information is being collated from the four demonstrators, including Reading, Stratford upon Avon and York (published). They were requested to provide answers to a number of questions that set out to find out how they went about planning, implementing and operation their UTMC systems; and the successes achieved and difficulties encountered.

1.1 Background Information

What is "UTMC"?

UTMC is a concept that has been developed for the next generation of traffic systems. The Technical Specification for UTMC Systems “encourages” the development of cost effective "UTMC systems" that manage (not just control) all kinds of travel in urban networks. It also encourages the integration of currently separate tools to support the overall management of the network. In this context, "UTMC systems" means specifically those that comply with the Technical Specification for UTMC Systems.

The Technical Specification for UTMC Systems has also been developed to facilitate information exchange between:

- individual applications such as traffic control systems, VMS systems, car park control systems and highway maintenance systems;
- other UTMC systems;
- inter-urban traffic control systems;
- emergency service systems;
- TV, radio and other media systems; and
- public transport and service provider systems.

Common, computer industry, open standards are used in the Technical Specification for UTMC Systems. This supports the use of already available hardware and software that has emerged from research and development by the computer industry. Adopting the Technical Specification for UTMC Systems will therefore provide both purchasers and suppliers with more choice and help reduce costs. The UTMC approach will also provide opportunities to industry to develop new markets and products.

The Need for UTMC

For many years, an important policy of many authorities was to minimise total network delay to vehicles. However, over time, different policies have evolved through initiatives such as Package Bids. Policies can now include:
− managing demand and congestion more effectively;
− influencing modal choice, route choice and when journeys are made;
− improving priority for buses and other public service vehicles;
− providing better and safer facilities for pedestrians, cyclists and other vulnerable road users;
− minimising delays for pedestrians and bus passengers;
− reducing vehicle emissions, noise and visual intrusion;
− traffic restraint in sensitive areas; and
− improving further overall safety.

Transport policies will continue to evolve. The Technical Specification for UTMC Systems has therefore been developed to support the existing and new traffic management needs of authorities, by providing a flexible yet comprehensive approach that also reduces costs.

**Overall Benefits**

At the offset, it was anticipated that the overall benefits of UTMC Systems would be:

− a wider choice of systems and components available to the user, at lower overall cost through the competition that open standards encourages;
− a greater choice of communications networks and services to allow new arrangements for communications, making best use of existing communication links and local opportunities for cost sharing, eg using cable TV networks for data transmission; and
− integrating a wide variety of information on network conditions from currently separate sources to support network management.

More specific benefits of UTMC Systems are given below. This is a generic picture and authorities would need to consider their particular need to determine how UTMC could benefit them.

**Operational Benefits**

The adoption of the Technical Specification for UTMC Systems should help provide detailed operational benefits. It could achieve these through the use of:

− easier ways of actively managing a highway network, not just controlling traffic. This could include using travel information as a means of influencing time of journey, modal choice and route;
− new traffic management techniques and systems;
− existing tools and techniques used in new ways;
− new technology; and
the sharing of information collected by currently separate sources, to gain an overall picture of the network.

UTMC Systems will also:

- let users build upon the best UK systems such as SCOOT and MOVA but also allow overseas developments to be used, if desired; and
- provide a platform for development of new ways to manage traffic that help authorities to implement systems that support their particular policies.

**Financial Benefits**

Signal control strategies such as SCOOT have proved to be very effective in reducing delays. As new functions are developed and added, UTMC systems will help to increase these benefits. For UTMC Systems can also reduce the cost of obtaining the "base" benefits from signal control by:

- encouraging competition in the supply, operation and development of systems, to allow a wide range of different functions from different suppliers to be "plugged" into a UTMC system;
- making the best use of international developments in new technology from the computer industry; and
- integrating two or more disparate systems to share the costs of communications links, for example public transport priority, bus stop passenger information or pre-booking of car parking spaces could share the communications used for signal control.

The reduction in communication costs will occur because existing UTC systems use leased telephone lines. The Technical Specification for UTMC Systems has been developed to exploit a wider range of communications options, either privately owned or provided commercially by a service supplier. It also allows for the use of digital communication, which is inherently more efficient and robust, and is the standard for computer communications.

Savings in communication costs could also be achieved by having most of a system's computing power located "on-street", eliminating the cost of continuous communication between the centre and the outstations.

The market for traveller information has not yet matured. However, there is scope in the medium term for sponsorship of information and, in the longer term, potential to sell information to offset the cost of its collection.

**Other Benefits**

In addition to operational and financial benefits, the use of a UTMC system has the potential to provide:

- new forms of information, for example origin-destination flows;
- more accurate information, for example better traffic flow data by combining UTMC data and vehicle locations from route guidance; and
more consistent information to the traveller, for example by combining VMS with radio messages.

Migration

Authorities should examine their own particular needs and plan how they can best use the opportunities offered by a UTMC system. Manufacturers and authorities have made considerable investment in UTC. To obtain the benefits of a UTMC System, while not writing off previous investments, will require staged development from existing products and systems. This “migration” path is the key to unlocking the benefits of the UTMC concept. It also allows expenditure to be matched to budgets.

Authorities will develop migration paths that best suit their needs and budget availability. However, there are a number of common problems that authorities now face including:

- ageing UTC systems which do not support current transport policy;
- high operational costs primarily related to high communication costs; and
- constraints on available finance.

One possible migration path that addresses these problems includes retaining existing communications links and on street equipment, such as traffic controllers, but replacing old central computers and their software with UTMC compatible ones. This could have the advantages of:

- replacing ageing equipment;
- providing an upward development path;
- allowing communications to be gradually upgraded to more cost effective equipment; and
- being a low cost first step towards a full UTMC system.

The next migratory step might be to install UTMC compatible communications to reduce communications costs.

The Technical Specification for UTMC Systems will help users take a phased approach by defining the requirements for "adapters" that can convert existing equipment to UTMC standards.

1.2 Document Structure

The remainder of the document is presented in a questions and answers (Q&A) style that addresses important aspects of planning, implementing and operating UTMC systems. The information was obtained primarily from the four demonstrators, which were selected in 2000 to showcase UTMC.

Issues are discussed under five general headings - Planning, Design and Implementation, Operation and Maintenance, Cost, and Performance.
2 Planning

2.1 What is the vision for your town/city and how did you create it?

The vision for Preston is encapsulated in a Vision Statement generated through the process defined in ITS City Pioneers. The Vision comprises an overall statement, an ITS Vision and a set of strategic objectives.

The Vision Statement sums up the long-range shared goals of all those involved in the planning of ITS for the Greater Preston Area:

Intelligent Transport Systems (ITS) will be used to improve conditions for the transport of people and goods in the Greater Preston Area. ITS will contribute to improving safety and mobility and increase accessibility for all members of the community whilst protecting the environment.

The ITS vision paints a picture in a general way of the potential results of implementing ITS in the Greater Preston Area:

- The people of the Greater Preston Area will be able to plan their journeys in advance and be able to predict with confidence when they will arrive at their destination.
- They will generally have the use of an attractive public transport option for a least part of their journey, which will be easy to use, easy to understand and easy to pay for.
- The centre of Preston will be a safe and attractive place for shopping and leisure activities with access being easy to use, easy to understand and easy to pay for.
- The ITS will operate in a largely self-enforcing manner without requiring additional police resources.

2.2 How did you gain acceptance for that vision within your local authority and among other key stakeholders?

ITS City Pioneers lays down a consultation process for the generation and acceptance of the vision. The first step was to hold an open meeting to which all potential stakeholders were invited. At the meeting the objectives and process for ITS City Pioneers were described and at the end of the meeting attendees were asked to register their interest in participating.

The next step was to carry out a City Review. The City Review is a data collection exercise focussed on the local area, examining existing transport plans and policies and advising on the existing implementation of ITS in the area. The local structure and development plans were reviewed as well as any transport strategy plans and the latest issue of the LTP. The views of representatives of the participating stakeholders with regard to local transport issues were obtained. The objectives of the various stakeholders were summarised and compared with a view to establishing a core of common objectives.

Based on the work carried out in the City Review it was possible to draft an outline Vision Statement and City Objectives. A draft of the Vision Statement was circulated to the stakeholders and then a workshop held to agree the final wording. The Vision Statement when finally issued included the logos of all the stakeholders.
2.3 What process did you follow to turn that vision into a set of achievable objectives?

The strategic objectives were developed in parallel with the Vision Statement. From the strategic objectives an ITS package of suitable ITS tools was assembled using the data and tables available in the ITS City Pioneers Toolbox. Following further consultation with stakeholders this was then developed into a Deployment Plan.

2.4 What were the specific objectives set for your town/city?

The strategic objectives agreed were:

- To maintain and enhance the vitality and prosperity of Preston as a retail, commercial and employment centre.
- To improve the operation, safety, efficiency and effectiveness of the local transport network.
- To improve the quality and reliability of travel information.
- To improve conditions for pedestrians and cyclists.
- To identify and allocate funding for investment in transport schemes.
- To support other local transport policies aimed at encouraging a shift from private to public transport.

The ITS Deployment Plan highlighted the following projects to be implemented to meet these objectives:

- Traffic Management – UTC Review, Bus priority, Incident detection
- Variable Message Signs – Car parks, Park and Ride, Strategic
- System Integration - System architecture, UTMC migration, Mobility Information Centre
- Access controls
- Smart cards
- PT timetable information
- Real time travel information

2.5 How did you plan the funding of that vision and how did it turn out?

Particular attention was paid in the Deployment Plan to the ownership of each project, funding, budgets and timescales as well as to the scope of the project. Because of the ‘top-down’ approach taken in the ITS City Pioneers process all projects were consistent with the Local Transport Plan and other stakeholders’ objectives and ideas. Thus funding was made available through the LTP with some developer funding also for specific measures.

Many of the projects identified in the Deployment Plan were consistent also with the objectives of the UTMC Demonstrator project. The additional UTMC funding enabled these projects to be implemented to UTMC standards, which will bring benefits in terms of system integration and providing a platform for future developments.

2.6 Describe the process you went through to identify the requirements of your UTMC system in order to develop your outline system architecture. What have been the key issues?

The requirements for the UTMC system were derived from:
The ITS Deployment Plan

User Needs Analysis

UTMC Programme research requirements.

**ITS Deployment Plan**

As a result of the City Pioneers work and the identification of the core objectives, the following ITS application areas were selected for immediate development under the Local Transport Plan. The Preston demonstration project provided an opportunity to set these applications in a UTMC environment. These were:

- SCOOT-based urban traffic control (UTC);
- Car park management;
- CCTV;
- Access control;
- Bus headway management;
- Traffic information exchange; and
- Transport information exchange.

Full details of the above measures were presented in an Inception Report.

**User Needs Analysis**

Although a good understanding had been established of local user needs in the ITS City Pioneers study, two years had passed since the original survey and it was considered desirable to re-interview the stakeholders at the beginning of the UTMC Demonstrator project with particular reference to the UTMC project proposals. The results of this were incorporated in a User Needs Report.

**UTMC Programme Research Requirements**

The demonstrator project was required to support the future development of the UTMC programme, in particular:

- To sponsor product development through so-called ‘common tasks’
- To undertake comprehensive evaluation and business case studies
- To undertake a communications study
- To undertake a safety analysis
- To promote UTMC by giving papers at conferences, issuing newsletters and hosting visits
- To participate in joint activities with other demonstrator sites and interested parties.
Together with the UTMC programme requirements and the scheme descriptions in the inception report, the user needs were used to develop a Functional Architecture based upon the KAREN\textsuperscript{1} model. In relating KAREN to UTMC, the UTMC Logical Architecture can be considered as an “example system” in KAREN terms, as it constitutes a specific interpretation of a portion of the overall KAREN Architecture. Consequently it is possible to map the KAREN UTMC29A Functional Architecture onto the UTMC Logical Architecture to derive the UTMC29A Physical and Communication Architectures.

KAREN was a useful mechanism for ensuring there was a strong correlation between user needs and the resulting functional architecture, although there was some difficulty in relating the site-specific user needs to the generalised KAREN user needs. KAREN embraces much larger and more wide-ranging systems than that being implemented in UTMC29A and so it sometimes seemed an overly complex tool for the task in hand. Nevertheless it enabled the generation of a true functional architecture which was independent of physical attributes and consequently did not pre-determine the location of software applications on particular hardware platforms in particular locations. The KAREN-derived functional architecture proved useful for:

- Confirming user needs were met – the style of presentation enabled this to be easily checked
- Preparing the specifications for the Common Database and Additional Systems – the style enabled this to be done in a functional way.

UTMC29 is obliged to conform to the UTMC Architecture, which, in KAREN terms, is a hybrid but closest to a physical architecture. The resulting architecture for UTMC29 shows the location of applications within nodes but leaves a degree of freedom, within node B (the UTMC instation) in particular, in terms of the choice of the number of hardware platforms and the exact configuration of the local area networks.

Because this style of presentation is well understood by engineers, the UTMC-based architecture proved useful for:

- Defining the procurement packages
- Determining the role and the interfaces of the traditional UTC and car park management elements
- Defining the information architecture and the data flows between applications
- Identifying the required data objects and MIBs
- Forming the basis of the System Safety Analysis.

\textsuperscript{1} KAREN (Keystone Architecture Required for European Networks) was a European project which developed a European ITS framework architecture
2.7 Who were the organisations involved in 2.6, describe their roles?

The planning aspects of the project were led by the Environment Directorate of Lancashire County Council, assisted by Halcrow Group Ltd. Halcrow undertook the ITS City Pioneers study, assisted LCC with their bid to be a UTMC Demonstrator, established the User Needs and developed the System Architecture. Halcrow then prepared the specifications and oversaw the procurement process.

The local stakeholders participating in the project are shown in the table below:

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Active</th>
<th>Passive</th>
<th>Observer</th>
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<tbody>
<tr>
<td>Lancashire County Council</td>
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<tr>
<td>Preston City Council</td>
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<tr>
<td>South Ribble Borough</td>
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<td>Lancashire Police</td>
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<tr>
<td>Highways Agency</td>
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<tr>
<td>Preston Bus</td>
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<tr>
<td>Stagecoach Ribble</td>
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<tr>
<td>St George’s Shopping Centre</td>
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<tr>
<td>Fishergate Centre</td>
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<tr>
<td>Chamber of Trade</td>
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<tr>
<td>Freight Transport Association</td>
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</tbody>
</table>

Active stakeholders wish to both provide and receive information, passive stakeholders wish only receive information. Observers wish to be kept informed of project progress.

2.8 Describe the migration path for your town/city?

The migration path identified for Lancashire County Council (LCC) reflects both the Council’s overall vision and their responsibility for systems county-wide.

At the outset of the project LCC had limited ITS facilities apart from a UTC system parts of which are 25+ years old. Upgrading this system is a key part of LCC’s plan. In the first phase, covered by the UTMC Preston Demonstrator project, the following steps were taken:

a) Introducing the Common Database

b) Replacing the UTC instation with a UTMC-compliant version with 19 new UTMC-compliant outstations and a SUPS-driven FEP for the remaining legacy outstations
c) Car park monitoring and access controls introduced initially as separate applications have been provided with interfaces to the common database

d) Introducing new UTMC-compliant applications for bus headway management, incident management and information exchange

e) Providing information to local stakeholders through common database viewers

f) Modifying the existing control room to accommodate the new facilities.

The system will then evolve over a period of years as funding allows to match LCC’s vision of a ‘total transport network’ (ttn). The key components of the tt n are a network control centre, a traveller information centre and, critically, a common database to permit information to be exchanged between them, with external organisations and through the Internet. This aligns directly with the UTMC concepts. Future plans include:

a) The gradual replacement of UTC outstations by UTMC-compliant versions across Lancashire

b) The introduction of new applications such as real-time information for buses

c) The expansion of existing applications across Lancashire such as car park monitoring and VMS

d) The increased use of shared communications and exploitation of LCC’s corporate network

e) The possible introduction of a custom-designed control room.

2.9 What were the outcomes and outputs of the planning phase?

The outputs of the planning phase have been incorporated into a number of reports.

User Needs Report

This summarises the outcome of the earlier ITS City Pioneers Study and updates it with more recent stakeholder interviews and UTMC requirements.

System Architecture Report

The system architecture has been developed from the user needs and in conformance with the general UTMC architecture. Based on the KAREN framework and the CONVERGE guidelines the following descriptions have been developed:

- Level 1 Functional architecture
- Level 1 Physical architecture
- Level 1 Information architecture

Safety Plan

The Safety Plan has been prepared in accordance with the guidelines laid down in the UTMC22 and is intended to ensure safety issues are covered during the development phase.
Evaluation Plan

The Evaluation Plan follows the CONVERGE guidelines and concentrates on evaluating the advantages and disadvantages of adopting the UTMC approach. It foresees a comparison between a ‘before’ and an ‘after’ case.

Communications Study

A communications study was carried out by Halcrow and Marconi, with particular emphasis on implementing SCOOT using UTMC SNMP protocols. This concluded that for the first trial phase in Preston individual point-to-point lines were required, as all the UTMC-compliant outstations are on a single BT exchange, but that, for the future, the situation must be kept continually under review.
3 Design and Implementation

3.1 What process did you use to derive your system functional specifications and, later, your technical specifications?

The system functional specifications were derived from the user needs and the ITS Deployment Plan and encapsulated within the System Architecture Report, as discussed in section 2.6. The functional specifications for individual applications were then derived from the system architecture report. These specifications were prepared by Halcrow and suppliers were required to respond with matching Customer Requirements Specifications and technical specifications as necessary.

In addition to the specifications prepared for the Preston Demonstrator, LCC/Halcrow prepared the generic functional specifications for the UTMC-compliant UTC instation and UTC outstation common task developments, which were subject to wide consultation within the UTMC community.

3.2 How did you appoint suppliers for your UTMC system? Were there advantages in doing it your way? What were the disadvantages?

A key element of the Preston Demonstrator has been the desire to procure the system through a process of competitive tendering using standard tendering procedures. It was decided there would be merit in putting a number of elements into one package to encourage consortia bidding and transfer the risk of internal communication between systems to the bidder. The following was thus adopted as a sensible system for tendering:

- Common Database and Additional Systems (CDAS) - comprising common database, operator workstations, Traffic Information Exchange, Transport Information Exchange, bus headway including the journey time measurement system. This supplier was also given responsibility for the following from nominated suppliers:
  - Peek FEP for legacy UTC outstations;
  - Peek UTMC interface for CORDON;
  - Siemens RMS upgrade for access control data; and
  - Siemens Siespace upgrade to UTMC standards.

- UTC instation;

- UTC outstations

In order to meet a deadline of Christmas 2001, certain items were procured in advance using non-compliant equipment:

- Car Park Management System – Siespace from Siemens
- Car Park VMS – Urbis
- Strategic VMS – Siemens.
The open tendering system has been carried out successfully. Sufficient responses were received for both the original Expression of Interest in response to the OJEC notice and later those invited to tender. Tender evaluation was relatively straightforward; negotiations were necessary with the preferred tenderer for the CDAS and with both potential suppliers for the UTC.

The advantages of the open tender process were:

- The imposition of the discipline of producing accurate and well-defined requirements for the functional specifications
- The opportunity to view alternative solutions and to select the preferred ones
- The opportunity to compare prices and delivery timescales and select the preferred supplier.

The disadvantages that have emerged during the procurement process include:

- Compared with a partnering approach, the tendering process is time-consuming
- Any lack of clarity in the procurement specifications leads to requests for uplifts in prices
- Interfaces and responsibilities of suppliers at the interfaces must be clearly defined. Risks must be clearly identified and an assessment made of which to retain and which to pass to suppliers.
- UTMC requires suppliers to both compete and co-operate, a process which requires careful management and strong leadership.

3.3 Were there delays of delivery from your consultants and suppliers? If so, what was the cause of these delays? How could they have been mitigated?

An early delay to the project arose from the introduction of the common task developments, where a consultation process was necessary before specifications and orders could be finalised. An IPR issue also arose on these contracts which significantly delayed order placement.

The second delay to the project has been the completion of the tender process from the original OJEC notice to the placement of orders on suppliers. With hindsight this process could have been planned better and greater attention paid to ensure its timely prosecution. Part of the delay can also be attributed to the fact that certain elements of the project were still under development and so significant negotiation was necessary before orders could be finalised.

Further significant delays occurred during the installation and commissioning phases.

These delays should arise less frequently as more off-the-shelf UTMC products become available.

3.4 Has UTMC enabled you to introduce new applications, which you would not have been able to implement otherwise? Which ones?

The new applications introduced depend on the availability of data from various sources stored in the common database. These applications included:
a) Incident management – based on journey time information from cameras, incident data from the UTC and QMISS data from the Highways Agency, and posting messages on VMS

b) Bus headway management – based on bus priority requests from the UTC

c) Provision of a wide range of information from different applications to local stakeholders through a common database viewer, and, in certain cases, obtaining data from them.

3.5 Did the technical specifications of your system meet your requirements entirely? If “No”, what were the changes and how did that affect your original plan?

The technical specifications proved satisfactory and were not amended during the procurement phase. The only change to the requirements resulted from the introduction of the real time passenger information (RTPI) project. As this covered the same routes as the bus headway project and provides the bus company with a superior management tool, the latter was rendered obsolete and, although operational, is not used.

A plasma screen has been purchased as an additional item for the control room to enable all control room staff and visitors to view a mix of the common database viewer, other system front ends and CCTV pictures.

3.6 How did you ensure your UTMC system is safe and secure?

A formal safety analysis was undertaken following the procedures and recommendations of the UTMC research project, UTMC22 in conjunction with the CDAS supplier. The approach adopted by UTMC22 breaks down the analysis into the key areas of the safety plan, system safety analysis, traffic safety analysis and HMI analysis. In Preston we found that:

- Preparation of the safety plan was a useful exercise in focussing on safety requirements and how they would be addressed in the project. Ideally this should be updated to reflect the actual analysis process and results.

- The system safety analysis was a relatively expensive exercise whose value it is difficult to assess

- The traffic safety analysis is an essential part of any traffic management project

- The HMI analysis proved the usefulness of early involvement of the operations staff in the design.

In general it was concluded that introducing UTMC in Preston did not introduce major new safety risks, provided that individual applications (eg traffic signal controllers, rising bollards) already operated in a safe manner under local or remote control. UTMC failures would result in a degradation of performance but not lead to an unsafe situation.
3.7 What aspects of your system were tested and commissioned?

The complete system was tested and commissioned in phases. The car park management system and associated VMS were installed and commissioned early. This was followed by the common database and its associated interfaces.

The new UTC instation was installed and commissioned along with the FEP for the legacy systems and the new UTMC-compliant outstations. For a time the old UTC instation operated in parallel and outstations were transferred in batches from the old system to the new. All 90+ outstations have now been transferred and the old instation decommissioned and removed.
4 Operation and Maintenance

4.1 In what ways is your UTMC control office operating differently from what you had pre-UTMC? What can you do now which you were not able to do before?

UTMC has enabled the control office to take a more pro-active view of network management and to shift the emphasis from fault monitoring and system maintenance to providing useful travel information via VMS and to stakeholders via the common database viewers. This shift in emphasis is a gradual process and will continue into the future.

To assist in this an automatic feed has been introduced from LCC’s own roadworks database HINCO, using XML, so that roadworks information appears on the operator's viewer, to avoid this information having to be entered manually.

4.2 Did your UTMC Control Office Staff require special training? If so, what kind of training?

Special training on the use of the new systems and equipment was provided by suppliers. In addition, a new suite of operator procedures was written and incorporated into the existing procedures to cover the additional functions now available to the control room staff.

The new procedures provide guidance to the UTMC system administrator and network operators on how to respond to the various situations that might occur during control room operating hours. This includes the regular procedures to be carried out by the control room operators such as logging on the network, adding information, changing shifts and archiving.

4.3 Do your Control Office Staff have the same responsibilities as before? If “No”, what has changed?

Existing responsibilities continue, but additional responsibilities reflect the shift in emphasis to network management and these responsibilities are covered in the new operating procedures.

4.4 What applications have you been able to integrate in managing your network? Which ones have been successful and which ones have not worked as well, and why?

The following applications have been integrated into the network:

- Urban Traffic Control
- Car park management
- Strategic VMS
- Bus headway management
- Remote common database viewers
- Incident management

In general the integration has been carried out successfully. Initially large volumes of SCOOT data were inserted into the database, but this was found to significantly impair the overall performance, giving a slow response to users, and the UTC adapter is now programmed to insert only INGRID alerts and UTC plan changes.
A number of problems were encountered with the installation of viewer software on stakeholder machines, largely due to security issues and obtaining clearance from the stakeholders’ IT specialists. Although stakeholders at the beginning of the project expressed clear preferences for direct access to the information, the viewers have not been used as widely as expected. During the period of the project, the information on LCCs’ own website, and on other websites, regarding transport conditions, has improved markedly and it is clear that, for passive stakeholders in particular (see section 2.7), this is sufficient for their needs.

It was found that the information that could be derived from the UTC system on the A59 was insufficient to give useful incident alerts to the incident management application and work is underway to introduce journey time cameras on this section to match those on the A6.

4.5 Has UTMC affected the way you exchange information with external agencies? If “Yes”, how?

Although it has been possible to incorporate QMISS data from the Highways Agency automatically into the common database, it has not been possible to establish joint operating procedures with the local motorway control office. This has been largely due to the pending change in responsibilities between the local police control office and the Highway Agency’s new Regional Control Centre, but also to police sensitivities regarding access to their systems. It is hoped to renew this initiative once the Regional Control Centre is established.

The QMISS data is used by the incident management application to suggest VMS plans to the control room operator.

4.6 Has UTMC had any impact on monitoring and maintenance of your applications? If so, what are the impacts?

A gradual process is taking place whereby the control room is using the common database viewer increasingly for monitoring and maintenance rather than the individual instation screens and this trend is expected to continue. This has had limited impact on the underlying procedures to date.

4.7 What are the key issues and lessons learnt on operating and maintaining your UTMC systems?

It proved useful at the design stage to pay attention to control room layout and to consult with control room staff to achieve the most effective design to bring the new common database viewer centre stage. It is clear that the involvement of control room staff at an early stage was useful to establish ‘buy-in’ and enthusiasm for the new system. Control room staff must be given ownership and allowed the opportunity to discover for themselves the capabilities of the new system.

The introduction of UTMC provides the opportunity for more pro-active network management. This can create resourcing and expertise problems for operators and this will present a major challenge for many local authorities including LCC.

The idea of extending control room operating hours has been examined, but this would increase the number of staff needed and thus add considerably to the cost of operation, and so has been discounted at the present time. Staff on call-out receive an automated email alert if an emergency arises and can then log on to the system remotely.
5 Costs

5.1 Does a UTMC system cost (capital) more/less than the implementation of the same non-UTMC applications? Please elaborate and provide ball park figures where available.

The Preston UTMC comprises:

- A number of applications hosted on their own instations provided with CORBA interfaces to the common database; some of these are legacy systems
- A number of applications hosted on the common database itself.

Obtaining the functionality available from the Preston UTMC system in a non-UTMC approach has not been costed, but is not expected to be widely different. The cost of providing the CORBA interfaces has been approximately £10-15,000 per interface.

The cost of the replacement of existing UTC outstations by UTMC-compliant versions can be significant, partly due, in the Lancashire case, to the difficult in fitting in existing traffic controllers, due to the different shape and wiring of the new units, but also to the higher cost of the SDSL\(^2\) modems. This can add £1000 per installation. An upgrade by BT to an EPS9 line also costs around £400 per controller.

Further detailed information is provided in the Business Case report.

5.2 How have operations and maintenance costs (including staffing and revenue) been affected by the implementation of your UTMC system?

Staffing costs have not increased with the introduction of the UTMC system, but would do so if operating hours were extended.

Maintenance costs have increased to reflect the increased equipment installed but no more than would be the case if the same functionality had been implemented in a non-UTMC compliant approach.

5.3 Were you able to benefit financially from a wider choice of systems and components through open competition? If “Yes”, how, and if “No”, why?

Open competition was a major feature of the Preston project and brought financial as well as performance benefits.

Four compliant bids were obtained for the ‘Common Database and Additional Systems’; the cheapest was selected and this was 50% of the price of the highest tender.

We were not tied to our existing UTC supplier for the new UTC instation. The bids from the two suppliers were close together in price.

\(^2\) SDSL (Synchronous Digital Subscriber Line) allows broadband speeds in both directions
Those elements which had to be bought from a nominated supplier, ie the interfaces for the legacy systems, were a relatively small part of the overall cost and generally reasonably priced, although some development costs had to be absorbed.

5.4 Were you able to benefit financially from a greater choice of communications networks and services, and through multi-application sharing of communications capacity? If “Yes”, please elaborate.

The Preston site made limited use of the potential for financial savings through shared communications and in the short term communications costs have increased. This is because:

- The UTMC-compliant UTC outstation links required a higher bandwidth than could be provided by multipoint and so point-to-point lines had to be installed
- The existing car park monitoring and VMS system operated on an unlicensed radio system with no revenue cost and so there was little incentive to upgrade this to UTMC compliance.

Considerable use was made of the Lancashire CC corporate network for the transmission of data. This enable the common database and the Journey Time system instation to be placed in the server farm and the journey times could be sent over GPRS using LCC’s existing service provider’s connection. This offered a significant saving in capital and revenue cost compared to providing a dedicated line.

5.5 Do you anticipate the benefits from UTMC to outweigh the costs? If “Yes”, over what time?

The Business Case study considered the financial benefits and costs over a period of 15 years and concluded that implementing UTMC was the most cost-effective approach. This conclusion is dependent on a number of factors, and the payback period could well reduce:

- The existing UTC OTUs are reaching the end of their life and are due for replacement over the next few years – the exact phasing of this is unknown
- It is assumed the capital and revenue costs of the communications bearers needed for UTMC will fall significantly over the period
- No assessment is included of the fact that this is now a relatively cheap platform for adding further applications in the future.

5.6 Has UTMC enabled you to leverage funds from the private sector? If so, which are the areas that have been attractive to the private sector?

Additional funds have been obtained for the project through development agreements but these cannot be specifically attributed to the appeal of UTMC.
6 Performance

6.1 Has your UTMC29 demonstrator been an overall success in providing you with a system that enables you to manage traffic better using your transport network? How important is ITS integration in your town/city?

The Preston demonstrator has provided a test bed and firm foundation for the development of ITS across the county. ITS Strategy studies have now been completed for Burnley, Lancaster and Accrington and, although the actual selection and implementation of tools will be different, all can and will be provided as an expansion of the UTMC system.

The implementation of UTMC is supporting the shift towards a culture of pro-active traffic management and will be a primary tool in supporting, for example, the Council's activities in meeting its obligations under the Traffic Management Act.

The potential of the system was not fully appreciated in advance and use of the system has led council staff to develop novel ideas for further development and the introduction of new applications. As a first step, an interface is being established with the roadworks database and future plans including an interface to the RTPI instation and the feeding of data into the LCC transport website.

6.2 Can you quote results that demonstrate the success of your UTMC system in the following areas (please provide quantifiable information where available);

- Integration (e.g. Bus patronage, modal shifts)
- Accessibility (e.g. Bus journey times and journey time reliability, average PT speeds)
- Network efficiency (e.g. Journey times, delays, congestion levels, vehicle km, average speeds)
- Environment (e.g. Air quality/pollution levels, noise)
- Safety (e.g. Accidents)

An evaluation programme is currently underway and features an impact assessment, user acceptance assessment and technical assessment. The assessment focus on the benefits of UTMC rather than individual applications and the results of this will be published in an evaluation report in due course. It is considered that the benefits of the individual applications (eg UTC, car park VMS) have been well established in previous projects.

6.3 Has the UTMC approach had any impact on the performance of your system, i.e. in terms of system availability?

Once initial teething problems had been overcome the UTMC system has proved reliable. The common database has experienced only one major outage to date and the performance of the UTC system has been trouble-free. No problems have been encountered with operation over the corporate network or with other communications channels, except the unlicensed radio system which is at the limit of its range for one VMS, leading to intermittent communications failures.
Any loss of availability through the introduction of a more complex system appears to be more than offset by the benefits of replacing older equipment with new.

6.4 How is your system performing with regards to the objectives set (pl refer to 2.4)?

The UTMC system is providing improved travel information for travellers in the Preston area through the car park guidance system and the strategic VMS and in due course via the LCC website. Anecdotal evidence is that the use of the VMS has led to a reduction in circulating traffic on the inner ring road. The strategic VMS are also used to encourage drivers to use a new Park and Ride site at Walton-le-Dale.

The more pro-active role being gradually adopted by the control room should lead to improvements in the operation of the local transport network.

Thus it is considered that the UTMC project is making a positive contribution to achieving at least the following objectives as intended in the ITS Deployment Plan:

- To maintain and enhance the vitality and prosperity of Preston as a retail, commercial and employment centre.
- To improve the operation, safety, efficiency and effectiveness of the local transport network.
- To improve the quality and reliability of travel information.
- To support other local transport policies aimed at encouraging a shift from private to public transport.

6.5 What are your Stakeholders’ responses to the impact of your UTMC project? Please identify Stakeholder group (eg Councillors, commuters, public, business community, etc.).

The stakeholders for the UTMC project are listed in section 2.7. Questionnaires were issued to stakeholders at the outset of the project to assess their expectations from the system and a second questionnaire is about to be issued. The results of the stakeholder surveys will be included in the Final Evaluation Report.

A further common database viewer has also been installed in LCC’s Emergency Planning Centre, and at Trafficlink, who are the main suppliers of traffic information to the media.

The UTMC Demonstrator, as well as being shortlisted in its own right, has also contributed to LCC winning the coveted ‘Local Transport Authority of the Year’ award for 2004.

6.6 What are your plans for the future (next 2 to 5 years) regarding your demonstrator?

The UTMC system is the platform on which LCC is building the concept of the ‘total transport network’. It will also be a major tool in enabling LCC to meet its obligations under the new Traffic Management Act. Specific plans in the next five years include:

- The extension of the system to cover all the major urban areas in Lancashire
• The interfacing of the system with other LCC systems, such as the roadworks database and the RTPI system

• The exporting of information to the LCC transport website

• The interfacing of the system and the agreement of joint plans with the Highways Agency and its representatives and with neighbouring authorities

• The continuing replacement of older UTC outstations with new UTMC-compliant outstations
## 7 Glossary

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
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<tr>
<td>CDAS</td>
<td>Common Database and Additional Systems</td>
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<td>FEP</td>
<td>Front End Processor</td>
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<td>GPRS</td>
<td>General Packet Radio Service</td>
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<td>ITS</td>
<td>Intelligent Transport Systems</td>
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<tr>
<td>KAREN</td>
<td>Keystone Architecture Required for European Networks</td>
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<td>LCC</td>
<td>Lancashire County Council</td>
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<td>LTP</td>
<td>Local Transport Plan</td>
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<tr>
<td>MOVA</td>
<td>Microprocessor Optimised Vehicle Actuation</td>
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<tr>
<td>OJEC</td>
<td>Official Journal of the European Community</td>
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<td>OTU</td>
<td>Outstation Transmission Unit</td>
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<td>PT</td>
<td>Public Transport</td>
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<tr>
<td>QMISS</td>
<td>Quantified Motorway Information Supply System</td>
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<td>RMS</td>
<td>Remote Monitoring System</td>
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<tr>
<td>RTPI</td>
<td>Real Time Passenger Information</td>
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<tr>
<td>SCOOT</td>
<td>Split Cycle Offset Optimisation Technique</td>
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<tr>
<td>SNMP</td>
<td>Simple Network Management Protocol</td>
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<td>SUPS</td>
<td>Simple UTC Protocol</td>
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<tr>
<td>UTC</td>
<td>Urban Traffic Control</td>
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<td>UTMC</td>
<td>Urban Traffic Management and Control</td>
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<tr>
<td>VMS</td>
<td>Variable Message Sign</td>
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<td>-----------</td>
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<tr>
<td>XML</td>
<td>Extensible Mark-up Language</td>
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