

The Smart Way

An introductory guide for English Travel Concession Authorities in the use of smartcards

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1 INTRODUCTION

This document is an introductory guide with the purpose of supporting those English Travel Concession Authorities (TCAs) beginning the process of considering or progressing the introduction of a “smart card” for concessionary fares.

The audience for this document is primarily TCA Policy and Managerial Officers rather than Technical Officers or specialist advisors.

The aims of this introductory guide are;

- 1) to show the steps needed to implement a fully smart scheme;
- 2) to highlight the decisions required by a TCA to be made along the process;
- 3) to explain why such decisions are important;
- 4) to provide other supporting background material.

The guide does not seek to provide all the answers to every TCA situation but will provide TCAs with pointers along the way. The final chapter does contain details as to where further help and assistance can be obtained.

Note: The world of smartcards and ITSO uses a lot of technical jargon. To help you, there is a glossary of terms and abbreviations in section 9.

1.1 Background

The Government, through the Department for Transport, is improving the way that concessionary travel works in England. From April 2008, all people aged 60 and over and disabled people will be entitled to free off-peak travel on local bus services throughout England.

Travel Concession Authorities will still be permitted to provide enhanced offers to their passengers above and beyond the national concession, for example where buses do not operate frequently and taxis are substituted or where peak validity or other modes are offered.

The way that Travel Concession Authorities make reimbursements for this will also change. Currently it is the concessionary pass holder’s own authority that pays for their travel outside their home area. From April 2008 it will be the authority where the traveller boards the bus that will pay the reimbursements.

To support the 2008 bus concessionary travel scheme, a new national pass will be issued to all who are entitled to the concession. The pass will be issued as a “smartcard” with a standard national design. The card will also conform to a single national card standard which is “ITSO”. This will make recognition easier for bus operators all over the country, as well as enabling the storage of electronic information to allow a greater range of user and system benefits. London is the exception to this where people entitled to the concession will continue to use their existing cards, with an additional sticker, until 2010.

Throughout the UK there are a number of TCAs that have already implemented or are well advanced in their planning of an ITSO based smart scheme (smart TCAs); this guide is not aimed at them.

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Rather, this document is aimed at those TCAs that have smartcards as a result of ENCTS, but which will be using them as flash passes on buses within their area, from April 1st 2008 onwards. These TCAs are referred in this document as 'non smart'.

When residents of a "non smart" area travel in a "smart" area they will use their cards as smartcards. This will create transaction data that will need to come back to the non smart area, which will not as yet have its own back offices equipped to handle such transactions, which is where ITSO Services Ltd (ISL) comes in. The services that ISL can offer such a TCA will be explained in greater detail later in this guide. It is currently expected that there may be up to 256 non smart TCAs on 1st April 2008, but that this number will drop significantly as more and more schemes go "smart".

1.2 Headline Summary

The minimum that Transport Concessionary Authorities (TCAs) have to provide is ITSO smart passes for concessionaires by April 2008 – the rest they can leave to ITSO Services Ltd. However there are very good business case reasons why this April deadline should be seen as the first step in a path leading to fully smart transport systems and then onwards to Citizen cards. So April 2008 is simple – except that the decision you make now may help or hinder where you want to be in future years.

1.3 Strategic Decision context

TCAs are required to provide smartpasses in the form of ITSO certified smartcards by April 2008, which means moving quickly on the concessionaire data front and on the smartcard selection, procurement and personalisation (adding a photo ID and name and address). All of these are closely linked and require a very tight timescale to achieve implementation.

The smartcard you select is probably going to have a life of at least 5 years. The smartcard can have other applications added later provided there is sufficient spare capacity available in the chip for these other applications.

The smartcard can also have other uses apart from providing entitlement to concessions on public transport. It could be used to reimburse taxi services for disabled people, thus reducing possible opportunities for over-claiming. It could be used to provide a range of local government services to residents and to pay for these where required. It could be used by transport operators to offer a loyalty system in a similar style to supermarkets and airlines.

Thus the smartcard, which starts life in April 2008 in most of England as a flash pass shown to a bus driver, could some years later be used in its electronic mode to access a range of services and entitlements, some of which may not yet have been identified.

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Before selecting the type of smartcard and particularly its capacity (which unlike personal computers can only be increased by issuing a new and more powerful smartcard) each TCA should ask itself the following questions.

- Are we likely to adopt or use a smartcard ticketing system for public transport for all types of passengers in the next 5 to 10 years?
- If the Train Operating Companies (TOCs or ATOC) introduced a smartcard ticketing system for rail travel in our area, would we like the concessionaires smartcard to be capable of being used for rail travel and would this include any payment facility for rail travel via the concessionaires card?
- Might we wish to allow transport operators to add applications to the concession smartcard in the next 5 years?
- Should we allow for the delivery and provision of local government services, such as library services, sports and recreational facilities over the next few years using the concession smartcard?
- Could we introduce or make available in the future, a payment facility from a third party on the smartcard for either public transport use (where free travel is not applicable) or for local council services?
- Do we have or want the skill set to add applications to existing smartcards relatively infrequently?
- Do we have the resources to issue large numbers of personalised and non-personalised smartcards during relatively short periods? Is it worth pooling smartcard issuing facilities with other authorities?

There are many other potential questions as it is always difficult to forecast technology developments over the next ten years, but it is suggested that each TCA considers the possible longer term developments before adopting the particular smartcard which is going to be in use for the next 10 years.

This guide aims to inform TCAs of the issues and options and you may also wish to consult your colleagues in other authorities as part of the decision process.

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2 SMARTCARDS

2.1 What is a smartcard?

The simplest analogy is to consider a smartcard as your wallet into which products (tickets) are placed, but what follows is a more detailed explanation.

A smartcard is a card with memory (a chip or integrated circuit) embedded within it. They come in a number of formats but the most common smartcards today are “chip & PIN” bank cards. In these cards you can see the chip’s connections (they are the gold squares on the front left of the card) and they connect a reader to the chip which is embedded in the card. The “SIM” card in your mobile phone is also a smartcard. More advanced cards also have an antenna embedded within the plastic so you can operate the card by passing it near the reader, but without actually touching it. Anyone familiar with “Oyster[®]” transport card in London may recognise that as a “contactless” smartcard.

To interact with a smartcard, you also need a reader, so the service that you’re using it with, for example a bus, can read the electronic data on the card. Smartcards don’t only have to use electronic data. They can also have information printed on the card, including a photo and logos.

The English national pass will have both. The electronic data within the chip of the smartcard will be used in areas in England where the buses have ITSO readers, while the information printed on the front of the card will mean that the card can be used as a traditional “flash” pass (you flash the pass at the bus driver) in areas or on bus services without ITSO smartcard readers.

2.2 Why can’t we just use our bank cards or Oyster[®] cards?

Although a lot of people will already have smartcards, such as their bank cards and/or their Oyster[®] cards, these can’t all be used together.

Smartcards are ways of storing electronic data in a very specific format. The way in which the data is stored will differ depending upon the way in which the information is to be used. For example, your bank card needs to hold your PIN in a very secure way, and has your account details encoded in it, but doesn’t need to know which Travel Concession Authority you belong to as that isn’t relevant to using a bank machine. Similarly, the national concessionary pass needs to have (amongst other things) your name, your photo and details of the Travel Concession Authority you belong to, because all of this information is important to your eligibility for a national concessionary pass.

In the public transport world this can make things difficult. If transport authorities were to design their own smartcard systems and they didn’t work with other authorities systems, it would mean that passengers would have to carry a wallet full of cards to be able to travel around England. Bus companies would have to invest a lot of time and effort in creating specific schemes for their buses, and there would not be a lot of competition between suppliers of smartcard systems because authorities and bus companies (which don’t replace their ticket machines very often) would be locked into one supplier.

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It is for this reason that the Department for Transport has sponsored an “open-specification” for smartcards called “ITSO.”

2.3 The benefits of smart systems

Smartcards and other smart systems can offer a lot in the way of benefits. From a scheme operator’s perspective they’re very good at reducing fraud. The cards (when used in a smart ticketing scheme) are almost impossible to copy because secure passwords stop anyone without access to them, reading what is on the card. This, combined with the fact that you can “turn off” any stolen or lost cards, means that they are no use to anyone once they have been deactivated. Smartcards can also reduce boarding times and can reduce the driver’s workload.

Another key benefit to Travel Concession Authorities is that of access to data. A fully smart ticketing scheme provides more data on journeys taken. This may assist in making sure that your reimbursements to operators are fair and also in meeting the demands for travel. Where surveys are used at present, the cost of these will be eliminated.

The other major benefit is to the customer or end user. As well as enabling faster boarding and making it less likely their pass will be stolen, the smart system also has the potential to make managing their experience with their Authority more streamlined and simple to manage, especially if other Authority services (for example library access) are also combined with the smart system.

You will probably be familiar with a lot of smartcard systems in use. Many building access systems use smartcards as do a number of transport operations. Most of these are proprietary or bespoke systems (set up for a specific purpose using bespoke and not publicly available technology). The biggest in this category is London’s Oyster[®] travel smartcard.

2.4 What does a smartcard actually do in practice?

Although there are lots of variants of what a smartcard system actually does, the following is typical of transport systems. When you touch your smartcard on a reader on a bus or at a train station, the card communicates with the reader and the ticket machine connected to the reader. The card and reader together contain the necessary information to determine whether you have the correct ticket products, or concessionary eligibility. Similarly, it checks the card number against a database of cancelled (“hot listed”) cards. Scheme rules can be programmed into the computer systems, meaning that time of day and route conditions can be verified. The right to concessionary travel will be determined from eligibility based on card validity and the time of day. If a “hot listed” card is presented to the reader, the reader will invalidate the card making sure that it cannot be used again.

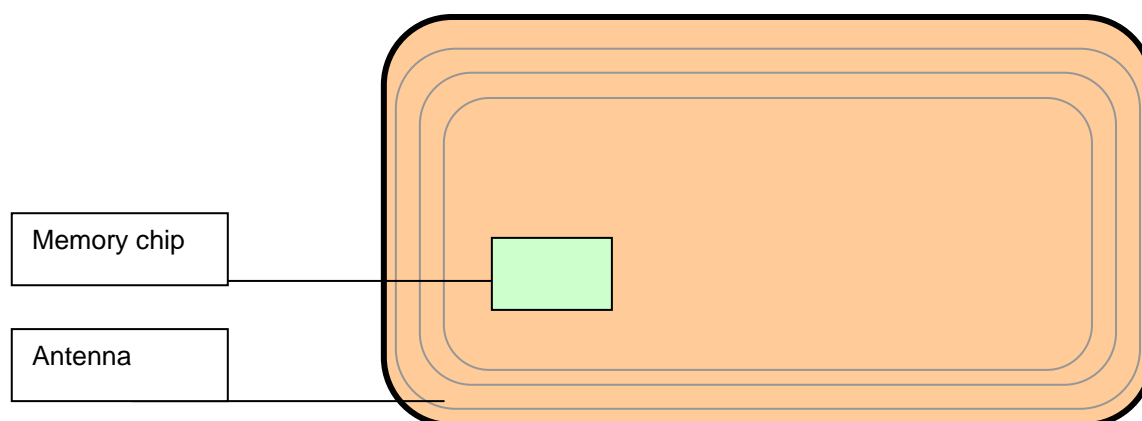
2.5 More about cards

As discussed earlier, an ITSO card has a memory chip on it and stores data electronically. The following diagrams show a cross section of a smartcard and how it stores information.

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Figure 1 shows a plan of a smartcard. The memory chip stores data and the antenna allows the chip to receive its operating power from a reader and to communicate with a reader without actually touching it.

Figure 1: a smartcard cross-section



This type of card is known as contactless. These are cards that do not have to be inserted into a slot but rather are placed in the vicinity of a reader. They work using an aerial built into the card and connected to the chip. The instructions to customers are usually to touch the card to the reader and then move on. It is widely agreed that contactless cards are essential for transport applications because they are quicker and easier to operate than contact cards. All Oyster[®] and other existing non ITSO smartcard schemes in the UK are contactless.

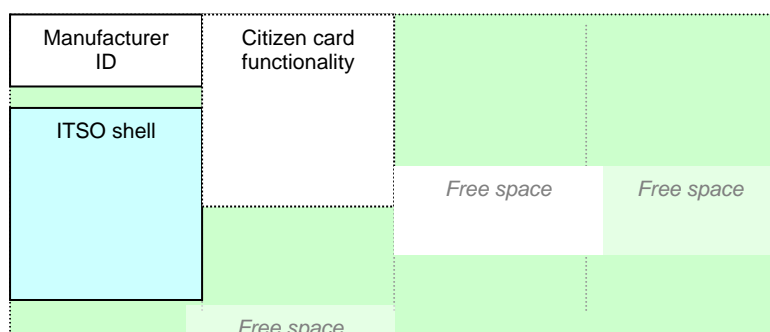
Contact cards which must be put into a slot are generally favoured by the banking industry and by those where speed of transaction is not of the essence. Contact cards are too slow when trying to move people through access points quickly: bus boarding, tube gate or football turnstile.

The market is developing dual interface cards: these have both contact and contactless interfaces, which service the same chip. This would satisfy all markets, but because the technology is more complex, prices are still relatively high. Therefore, it will be some time before we see many of these used in the marketplace.

Contactless cards score highly in regards to card appearance, as there is no visible chip or magnetic stripe to work around. However, the cards need to display a unique number and the law also requires a help line contact number to be displayed on the card.

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Figure 2: a memory chip plan

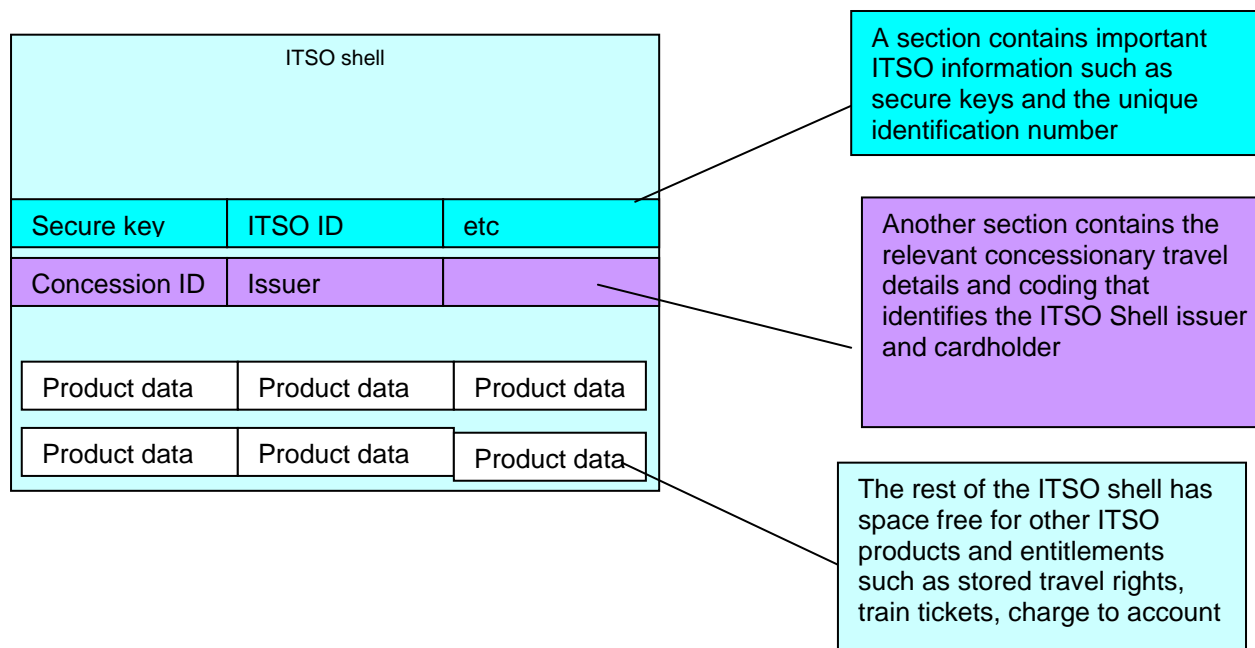


The memory chip stores data in a variety of formats and this memory can be used for a lot of functions. Cards can also have different amounts of memory depending on what they are used for. ITSO requires the card to be one of 8 different types (details can be found in the specification). This range of cards allows a scheme to pick the type of card most suitable for their proposed usage. For example, a small or large memory size, low cost “throw-away” cards or high power citizen cards. All of these approved card types are capable of storing data in an agreed way. This agreed way is called a “shell” and is shown in Figure 2. This ITSO shell is a way of keeping a section of the card’s memory for separate use in the ITSO format. If the card has a lot of memory, the other parts of the chip can be used for other functions, meaning that an ITSO smartcard could also be used for other things, such as citizen applications. Memory is quantified with its own set of units and abbreviations. For example, a common card type is the Phillips Mifare® series which come primarily in the “1k” and “4k” varieties. 1k and 4k refers to 1 kilobyte and 4 kilobytes of memory respectively.

Figure 3 shows how a 4k memory card might work. The memory is arranged in sectors with different shells or non-ITSO data sitting on the card. Every card will have manufacturer’s identification and in this example the ITSO shell sits after that. Here we have also shown how a citizen card function might sit on spare memory on the card. Broadly speaking, it does not matter what else you put on that memory, but there are some technical specifics that determine where the ITSO shell sits within the card.

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Figure 3: the ITSO shell



There are a wide variety of product types available within the ITSO scheme that can be used if you have a more complex system but you don't need them for concessionary travel. These products are sub-sets of data within the shell, a little bit like files on a computer. For example, a Windows® computer file is stored in subsets. A common directory structure in Windows® is that of the "My Documents" filing. Here, when you open the "My Documents" folder, you are presented with a directory of all the files on the computer and you can access any particular folder to access the relevant one to you. In ITSO, the card is equivalent to the "My Documents" high level folder, with the shell being the directory and the product being the individual folders.

Card types

The ITSO specification recognises current popular contactless smartcards, such as Mifare 1K and 4K, JCOP, DesFire and Calypso. But all are interoperable, giving schemes the ability to choose the media which is most appropriate to their application: perhaps using low memory for single journeys, and a higher specification for concessionary travel cards, which may also be citizen cards

Broadly speaking these 8 types can be described in 3 categories, each with their own characteristics.

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Card Type	Advantages	Disadvantages	ITSO CMD	Trade Names	Cost *
Contactless Memory Card	<ul style="list-style-type: none"> • Low cost • Easier to implement • Greater opportunity to recover cost of issue than larger cards – migration to deluxe card 	<ul style="list-style-type: none"> • Less secure • Small memory - single application • Possibly lower value for money compared with other cards • Not future proof • Short Life 	4 or 5	Mifare Ultralite; Innovision	30p
Contactless Secure Memory Card	<ul style="list-style-type: none"> • Room for more than one application • Moderate cost • Sufficient security • Good value for money • Long Life 	<ul style="list-style-type: none"> • No migration to deluxe card option • Medium level of future proofing 	7	Mifare 1K Mifare 4K DESFire	X2
Contactless Microprocess or Card	<ul style="list-style-type: none"> • High security - only option for proof of ID applications • Better support for multi-application • Current state of the art • Long Life • Becoming the cost effective solution for citizen/multi-application type cards 	<ul style="list-style-type: none"> • Still little practical experience around 	2	JCOPS 30 or 41; Ecebs Multefile; Calypso	X4 X3

*approximate costings as at September 2007

You will note that the table refers to contactless cards; the type that do not have to be inserted into a slot. Strictly speaking, we should be referring to the cards as to *Customer Media Device (CMD)* (which is the international standards' wording), because latest technology developments allow manufacturers to present the (smart) chip incorporated into other forms: key fobs, rings, watches and mobile phones.

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2.6 The ETM (POST)

The electronic ticketing machine (ETM) is the machine that the bus driver logs on to at the start of the shift and uses to issue tickets to passengers. An ITSO reader can now be integrated with a number of the newer ETMs and the entire device can be ITSO certified. In the ITSO world it is called a Point of Service Terminal (POST). In some ETMs the reader can be remote from the rest of the ticket machine.

When a smartcard is presented to the reader, the ETM checks that it can read the card. If it contains a valid ITSO shell it will recognise the card. At this point the ETM will check if the card and shell are still valid – they may be listed on a hot list in the ETM. If the card is on the list then it will be rejected. It then checks with the software on the ETM to see that the organisation that issued the ITSO card has an agreement with the bus operator. Assuming it does (which will be the case with the concessionary scheme) it will accept the card and store the transaction data from the card on the ETM. All of this will happen in a fraction of a second. When the ETM is next synchronised (either by driver module, or wireless data transfer in the depot etc) this transaction data will be passed to the Host or Operator Processing System.

2.7 The Host Operator Processing System (HOPS)

The Host or Operator Processing System (HOPS) is a computer that records transactions. The HOPS is made up of a number of functions including:

The Asset Management System (AMS)

Every physical device within an ITSO network needs to have a “secure application module” which is a chip much like the one in the smartcard. This is called the ISAM in ITSO language. The AMS is the interface between the ISAMs and the ISMS service. It looks after the distribution of the security keys which are necessary to ensure that only approved devices can function on the network.

The AMS communicates with the ITSO Security Management System (SMS). This system manages the secure keys (hidden digital codes) so that only valid ITSO products will work on the system. The issue and management of all secure keys to all ITSO licensed systems is carried out by this ITSO Security Management Service.

Data storage

The HOPS stores information on ITSO Shells and Products issued by the HOPS owner, and the related usage records.

Hot listing

This ensures that, just like a credit or debit card, when a smartcard is cancelled (for example reported stolen by the owner) that all the ITSO equipment that the card could be presented to knows that the card has been cancelled and that it should not accept it.

Normally the rules for hot listing are decided by the scheme owner. For ENCTS this is the DfT and as such they are currently working with ITSO Services Ltd TCAs, operator and ETM supplier representatives, to agree these rules. These rules will

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include such guidance as driver instructions, inter authority communications and warm listing (this is what may happen to a lost or stolen card while we wait to see if it is being used illegally somewhere).

Communications between multiple HOPS

One of the key benefits of an ITSO system is that it allows communication between ITSO licensed operators and their systems. Any certified ITSO HOPS will allow electronic communication between itself and other HOPS which means that usage and card information can be passed between operators for reporting, product updating and fraud protection. This is essential if passengers are travelling on journeys across different operators and allows TCAs to work together.

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3 ITSO

3.1 What is ITSO?

ITSO is a membership, non-profit sharing organisation, which evolved from an initiative in 1998 by the major players in the transport industry. These included Transport for London, the Passenger Transport Executives (particularly Merseytravel and GMPTE who both gave vision and financial support), some of the larger Travel Concession Authorities, all of the major bus groups, the train operating companies through ATOC, Industry Suppliers, and the Department for Transport.

The primary focus of ITSO was the creation of a specification for interoperability using contactless smartcards for transport applications. Originally published as version 2 in March 2004, today the ITSO Specification rests at Version 2.1.2, which was released in July 2007, and is Crown Copyright available to all.

The ITSO specification is unique in a number of ways:

- It supports a wide range of smartcards, whereas other specifications often support only one. In ITSO, the choice ranges from low cost and low memory cards to top of the range microprocessor cards.
- It covers the whole life journey of transport applications and so specifies card data, card formats, point of service activities, transaction formats and back office processing, providing a complete end-to-end specification for interoperable smartcards.
- It supplies the environment, specification and keys for end-to-end security management. This, again, is unique, as other schemes provide usually only a card key. ITSO provides cards, shell, and product keys and in doing so ensures loss less transactions.
- It provides the security architecture for both the card and back office transactions necessary for the secure loss-less transmission of data amongst interoperable schemes. This includes the architecture for the authority levels of operators' points of service.
- It enables interoperability (see below).
- It allows non-transport applications to sit alongside the ITSO application on the card, or to sit inside the ITSO application as 'private' applications, using data structures that are independent of ITSO, but utilising all the ITSO facilities such as security.
- ITSO also provides a certification process which ensures that the various elements of a scheme meet the specification and interoperate correctly.

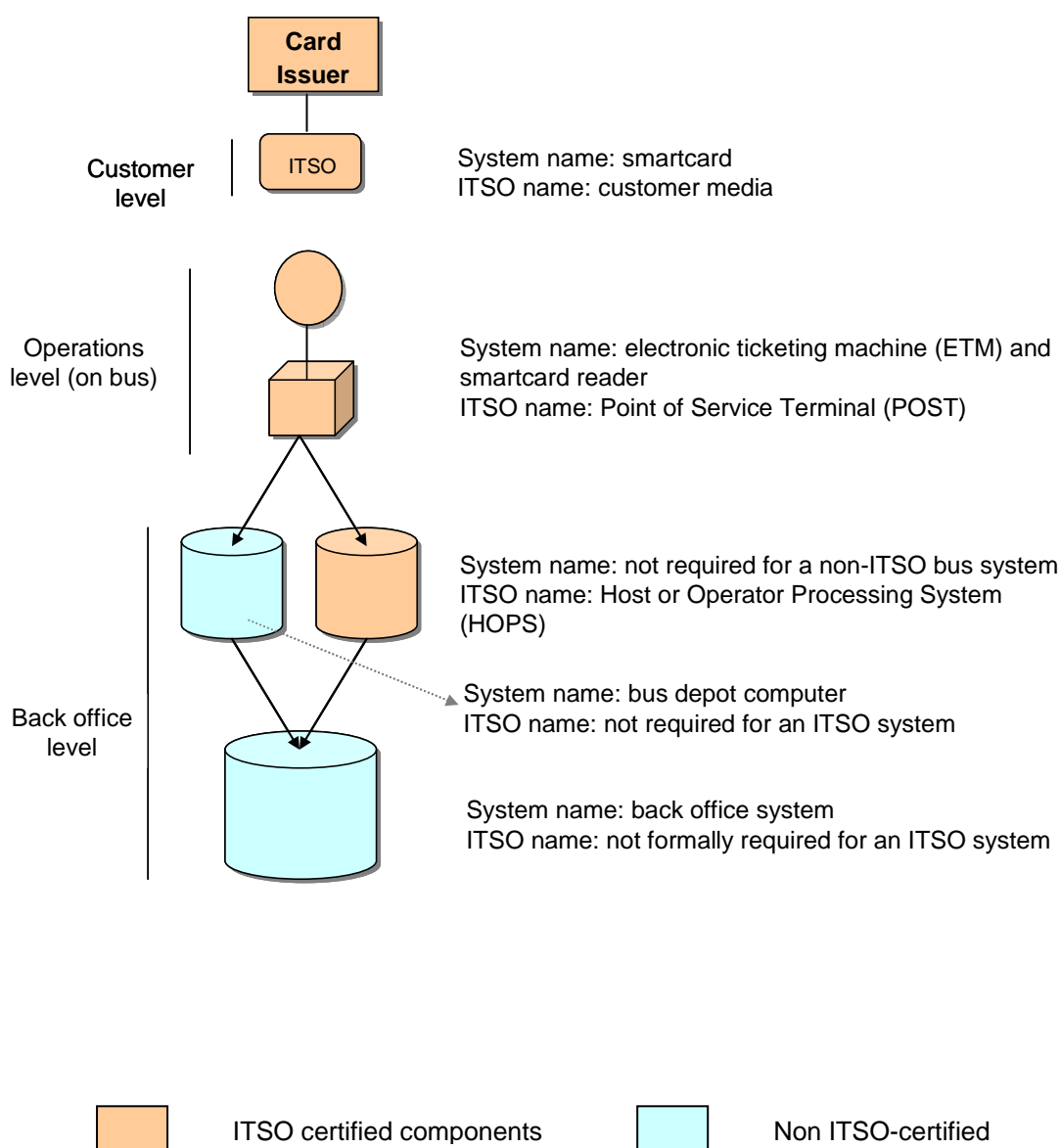
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3.2 What does an ITSO scheme do?

The main feature of ITSO (it used to stand for the **I**ntegrated **T**ransport **S**martcard **O**rganisation, but now is a single word) is a specification for how approved ITSO smartcards and systems all need to communicate with each other to make a scheme work. ITSO is an “open specification” which means that the specification is public information available to any equipment supplier, operator or travel concession authority.

There are a number of parts of the smartcard scheme that ITSO approves (or certifies) and these have very specific names within ITSO. Outside ITSO these parts often have a different system name as illustrated in the following:

Figure 4: an ITSO system



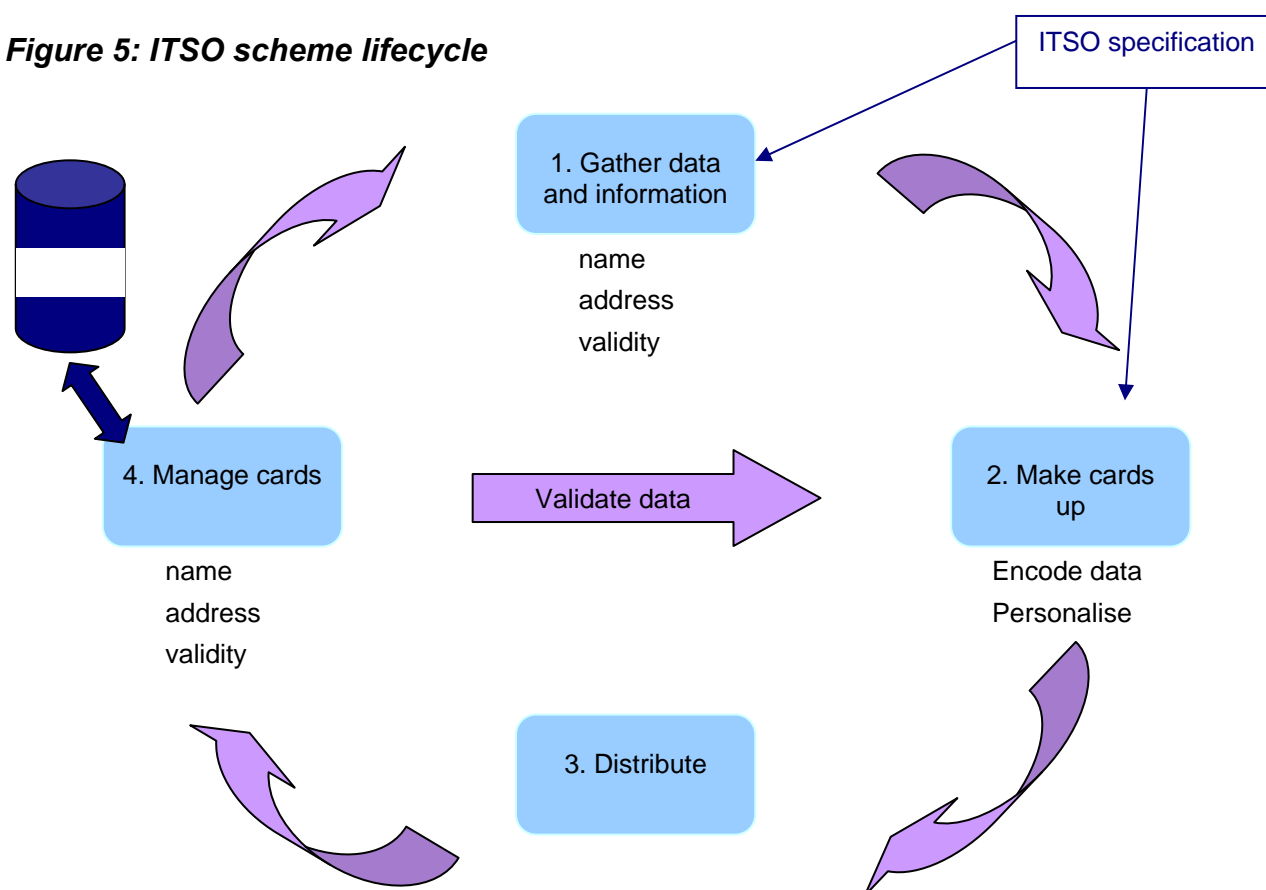
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However, for a scheme to be an effective live operation it is necessary for a back office system to provide for customer/concessionaire relationship management, product management, transaction processing, reimbursement calculation, revenue allocation and financial accounting functions in addition to the ITSO elements of the system.

3.3 The ITSO lifecycle

The following diagram shows how a Travel Concession Authority needs to manage its ITSO scheme and information over time. This shows an initial deployment that may become more sophisticated over time, especially in relation to the HOPS at stage 4, and offers the opportunity to add more products and services.

Figure 5: ITSO scheme lifecycle



As an issuer of ITSO cards, there are a number of things that you or a collaboration of a number of Travel Concession Authorities will need to do over the lifetime of the concessionary travel scheme.

Firstly you will need to gather data. This data content is in many ways similar to the data that you would need to issue any other pass (whether smartcard or not) but

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there are some specifics about the way that it should be stored and arranged to make card issuing simple. The ITSO specification determines what formats the data takes and the Department for Transport's framework specification contains the relevant information for the concessionary travel product.

Secondly, when you have all of this data, it will need to be encoded into the card and printed onto the front of the card. This requires a set of specialist equipment including a special ITSO module (called a SAM which is like a mobile phone SIM card) to go into the card printer. Thirdly you need to distribute the cards to the concessionaires.

Finally you will need to manage the set of data and card population. As people reach the age of 60, move into and out of the local authority area, pass away, become entitled to disabled travel concessions or have their cards expire, you will need to update the database and issue new and replacement cards. This involves the physical reissue (returning to box 2 on in figure 5) and revalidation of data. It also involves the management of the card data and product details via an ITSO HOPS (as per box 4) which will be particularly important in the future with more data sharing requirements.

In this environment, ITSO certifies the equipment with which the card interacts and also the systems that store and communicate data. It also manages and specifies product types and information (data) formats.

3.4 Interoperability

Interoperability is the cornerstone of ITSO but it can have a number of different meanings:

- the acceptance of the cards (smartcards) on different modes of travel, for example, Bus and Rail within one locality;
- the acceptance of cards between localities or distinct geographical locations, for example, Manchester and London;
- products (tickets or e-purse-type products) that can be used interoperably between different operators in either the same or different locations, for example, Virgin Rail and First Group Bus.

In terms of the above three definitions of Interoperability, ITSO has been designed to enable all of them but mandates only one – the cards interoperability.

Card Interoperability. There is one fundamental requirement for interoperability in the ITSO environment. This is that any defined ITSO Customers Card is capable of being used any time, any place, any where there is equipment being operated under an ITSO license. This covers the first two of the above definitions, but there must be a commercial agreement in place.

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This means that Products may be loaded to any Card at any participating product loading point, provided, of course, that there is a commercial agreement in place between a retailer and a product owner that a customer can purchase a particular product at that location. For example, I can take my card, issued to me in Leeds, to Manchester where I can use it to buy a Manchester-only Arriva Travelcard, which will enable me to use my card only in Manchester while and where the product is valid (probably only on Arriva buses). What I can't do is go home to Leeds and then use the Manchester-only Arriva Travelcard on the bus in Leeds (even on Arriva buses in Leeds – unless, of course, Arriva Travelcards valid in Manchester are accepted in both Leeds and Manchester by Arriva).

Product interoperability.(The commercial agreement) ITSO is not involved in this aspect, although the ITSO Specification enables Operators, Product Owners and Retailers, to implement the commercial agreements they have come to. In the case of ENCTS the commercial agreement exists by virtue of statute (The Concessionary Travel Act 2007).

Clearly, some standardisation of trading practices and some common procedures will be desirable, hence the development by the Association of ITSO Licensed Operators (AILO) of various Codes of Practice. Eventually, Members may wish to see some of these mandated. In due course, if that proves to be the case, if its Members agree, ITSO will embody them in its Operating Licences.

In simple terms:

- Cards may be used anywhere to have products loaded on them (but only the products permitted to be sold at that location).
- Products are usable only where they are accepted under a commercial agreement (by Service Operators).
- ITSO Interoperability does not mean that all ITSO Products are sold or accepted everywhere.

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3.5 What does ITSO brings to the party?

ITSO adds a level of functionality to smartcards which enables not only transport, but other applications to co-reside on the same card.

Possible LA Requirement	ITSO applicability
A range of cards, which could be used in different environments e.g., Low memory cards - single events Memory cards - Library cards - Microprocessor cards - Citizen cards	ITSO offers a range of cards on an interoperable basis, meaning that all cards can be recognised at all points of service. Consequently an event ticket may be loaded on a citizen card or a low cost card.
Library card	The ITSO ticket definitions can easily be utilised as membership details, and the stored value or loyalty facilities could be used as payment mechanisms for additional services. Interoperability between libraries can be provided and, if necessary, secure end-to-end data for 'settlement'
School meals	Again, the ticket definitions can be used for entitlement, stored value transactions and loyalty schemes for such as healthy eating. Reload points can be located outside schools in libraries, local shops, etc. to reduce school gate bullying, yet with secure data (money) reconciliations.
Event ticketing	The range of cards would allow for both low and high cost events and would allow associated transport ticketing.
ID	The ITSO Secure Access Module (ISAM) will allow a range of security appropriate to entitlement, ID,
General	The ITSO card directory structure allows for 'private' applications to be defined and to utilise the ITSO card security and data transfer.
Citizen use of cards without boundaries	The ITSO specification and key management service allow controlled use of applications nationwide as required. Data may be securely cleared and settled.
Applications must work on all card types and service	ITSO certification & testing can be extended to

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Possible LA Requirement	ITSO applicability
points	integrate further data structures, different application kit, etc.
Smartcards and applications need key management	The ISMS is ambivalent of the application and could be extended to include LA schemes to avoid large development costs of a parallel system.

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4 TCAS AND SMARTCARDS

4.1 Setting up a scheme now in time for April 2008

TCAs which are currently not “smart” do not have time to set up a fully smart scheme now for April 2008. Instead they must fall into the category of “non smart” i.e. providing smartcards and leaving the rest to ITSO Services Ltd.

The diagram in Figure 6 outlines what needs to be done. What ITSO Services will provide is explained elsewhere.

4.2 Your choice of card now

Because the card will be ITSO based, TCAs will have a choice of the card type they adopt. This section begins to explore some of the issues that should be considered when the choice is being made.

As a specification, ITSO is unique in terms of interoperability. The range of cards, from small memory low cost cards to the top end microprocessor cards, gives schemes enormous potential. Eight different types of cards are included in the ITSO Specification. This gives scheme designers a wider choice of cards to suit their application, which may even include a number of types within one scheme. For example, a Campus may choose to use a Mifare 4K for its students to cater for the core applications such as transport, cashless environment, library, leisure and access. But for the outside visitor who comes to a 2 day course, a low cost card may be issued which will identify the delegate and, perhaps, provide a free lunch.

The same type of example could apply in, say, a Local Authority: where residents may be given a more powerful card with multiple services on it; whilst tourists have simpler cards. For the one-off event, such as a concert in the park, residents could have their ticket added to their cards, whilst ‘in-comers’ would be given a low-memory card just for the event.

There are however other considerations. Obviously, the debate has to be wider than cost. Issues such as security, back office facilities, marketing image risk all need to be considered.

4.3 A special word about Mifare 4K cards

Because of the way these cards work, you must ensure that your card supplier uses the DfT/ITSO preferred structure for the ITSO Shell. This structure has been specifically designed to allow TCAs to easily add other applications later.

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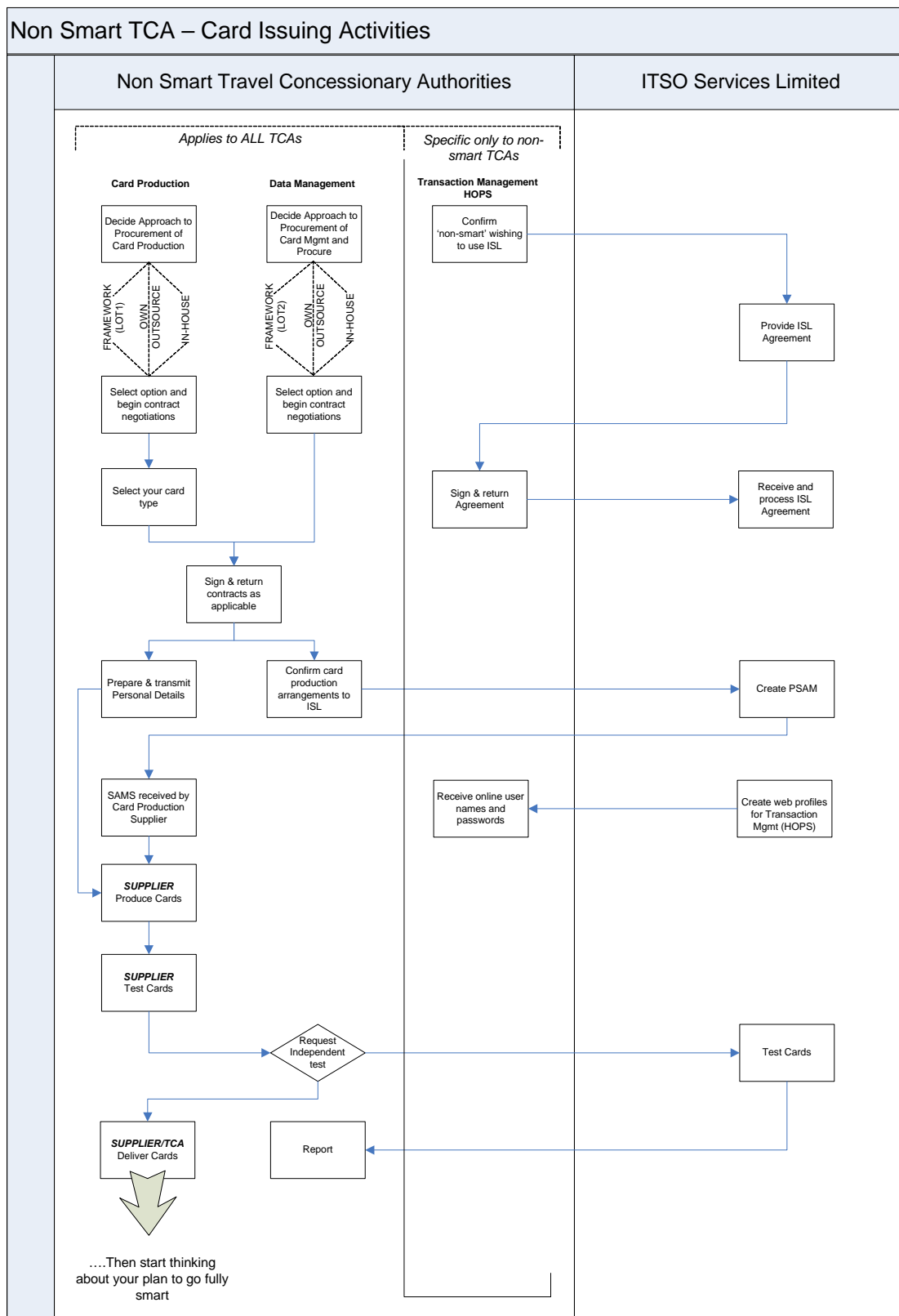


Figure 6

The Smart Way

4.4 DfT Framework Arrangements

The DfT Framework Agreement provides an easy first step for those TCAs unable because of timescales or not wishing to become fully smart at April 2008.

The Department for Transport's Framework Agreement has been set-up to allow authorities to procure all the services needed in order to issue ENCTS smartcards. Other than setting up the framework, the Department for Transport will not be further involved in the procurements, meaning that you're free to get on with establishing your scheme. All of the procurement lots have been created to allow you to contract directly with pre-vetted suppliers at pre-agreed rates. The Framework Agreement has been set-up to be transferable so you don't need to go through your own European procurements (unless you want to). Given the tight timescales, we recommend that you get everything ready as soon as possible. Please note that for full details you should read the ITT Framework Agreement itself – the following is only meant to be a quick summary.

Lot 1: Card production service

This lot is designed to provide you with a "one stop shop" for producing and distributing ITSO-compliant bus passes with an optional data gathering service. You can pick and choose the elements of this service depending on the needs of your scheme.

If you don't want to use the Department's Framework to produce and distribute the passes, you can do this through a supplier of your own choosing. The important thing is that they are ITSO certified and a list of the suppliers with ITSO certified kit can be found on the ITSO web site. In this instance you can still choose to reference the Framework specification (which outlines the technical requirements) in discussions with your supplier.

Lot 2: Card management service

This lot is designed to provide you with a database for card and cardholder management. This information will need to be in specific ITSO format so that the cards can be reissued and hot listed.

Again, if you don't want to use the Department's Framework to manage your data on an ongoing basis, you can choose to do this in-house or through a supplier of your choosing. The important thing is that the data is in an ITSO compliant format. Similarly to LOT 1 you can still choose to reference the Framework specification to see the proposed specification.

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Lot 3: ITSO HOPS

The HOPS is a specialised piece of computer software (and associated hardware) for use in an ITSO environment. Initially the only TCAs likely to procure their own HOPS system are those wishing to run a full smartcard scheme (with readers on buses etc, although investing in this as part of a planned or stepped migration to full smart can be an option for some). For the majority this does not apply as most TCAs will only want to use the framework agreement to issue Smartcards and then just use them as flash passes when the scheme goes live. For these TCAs the necessary parts of the HOPS functionality can be made available via ITSO Services Limited. As TCAs go fully smart they should consider working together to provide their own HOPS facilities.

If you are one of the TCAs wishing to procure your own HOPs system and also wish to do this outside of the Framework Agreement, then you must ensure your system is ITSO certified.

Lot 4: Production equipment

If you wish to physically produce your own cards, reissue cards instantaneously or to manage eligibility once the majority of the cards have been issued, you will need a set of equipment to sit in your office(s). LOT 4 puts you in touch with pre-vetted suppliers and allows you to buy the necessary card issuing and personalisation machines which will print information on the front of the card and encode data onto the chip. It will also allow you to buy blank cards and all necessary communications infrastructure to issue cards yourself.

If yours is one of the TCAs wanting to produce its own cards, you can procure the card issuing equipment outside of the Framework through your own supplier. Again, the important thing is to ensure that everything is ITSO certified.

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4.5 Options to start the ENC implementation process

The following procurement table provides some examples of potential options that different TCAs have. What you need to do now depends on where you are and where you want to be.

Travel Concession Authority options in late 2007

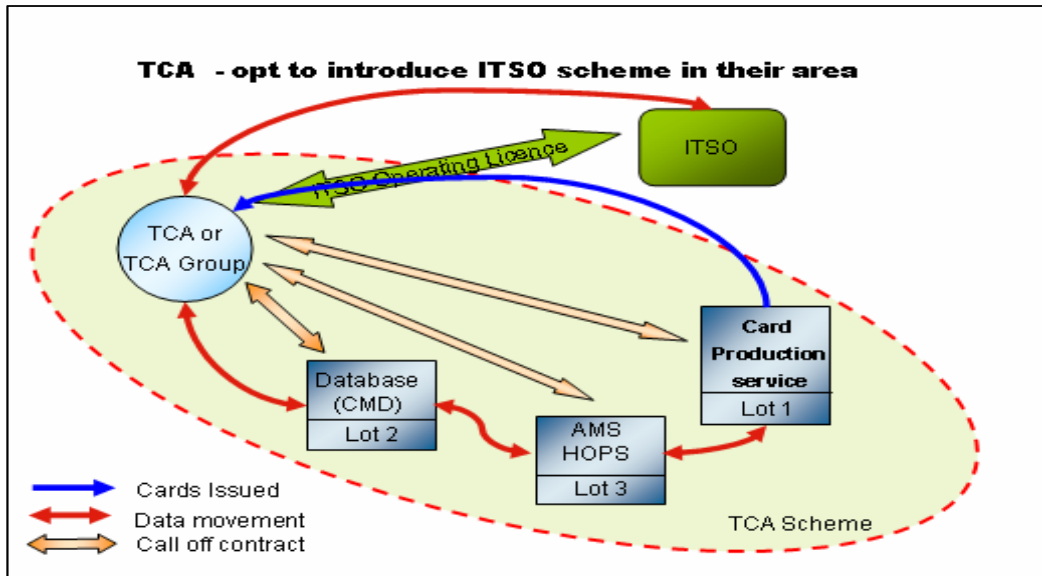
Authority Situation (starting point)	DfT Procurement Lots				Membership	
	Lot 1 <i>Card</i>	Lot 2 <i>Mgmt</i>	Lot 3 <i>HOPS</i>	Lot 4 <i>HW/S W</i>	ISL <i>Ref 4.6</i>	ITSO
1) Full smart ticketing						√
2) Partially smart, plans to expand smart ticketing (before Apr 08)	√		√			√
3) Not smart, plans for smart activity (before Apr 08)	√	√	√	√		√
4) Not smart, no plans for smart activity	√	√	Via ISL		√	
5) Not smart, no plans for smart activity (but do have an existing data management system)	√		Via ISL		√	

The important thing to remember is that you can pick and choose from the Framework services as it suits your scheme. Remember that if you have any questions or require guidance on a specific issue then you can contact the DfT's dedicated support team by emailing CBTBILL@DFT.GSI.GOV.UK

Two of these scenarios are further illustrated on the next page.

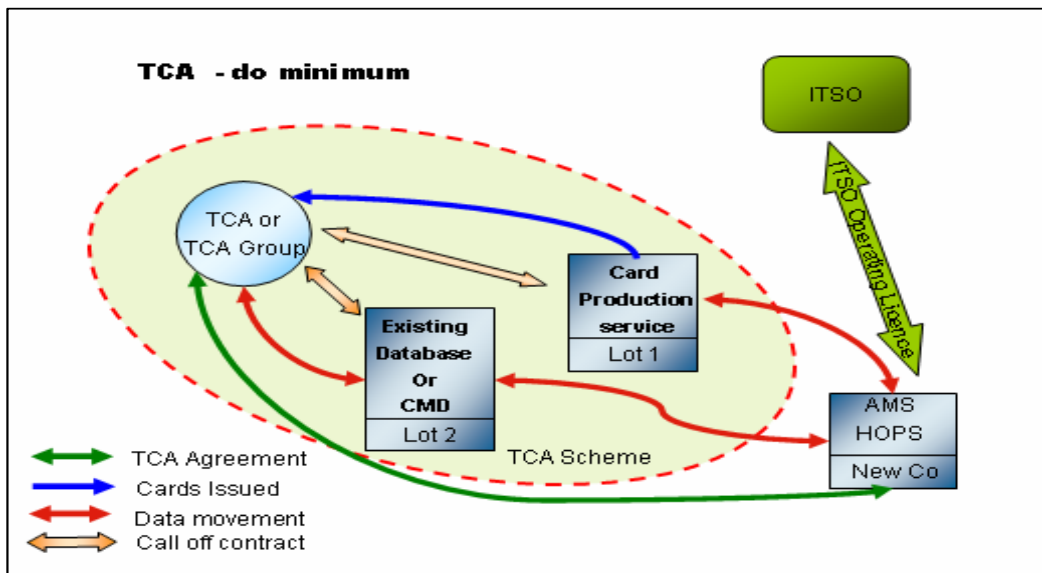
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Figure 7 - Scenario 3 – TCA wishes to implement a full ITSO scheme in their area, but does not wish to do so through in house services.



In this scenario the TCA is required to become a direct member of ITSO and has direct contract relationships for all procurement contracts (i.e. allows TCA to contract directly with pre-vetted suppliers at pre-agreed rates); all costs are therefore borne by the TCA.

Figure 8 - Scenario 4/5 – TCA wishes to implement a full ITSO scheme in their area, but does not wish to do so through in house services.



In this scenario, the TCA requires direct contract relationships for Card Production and may also require Card Management, all costs borne by the TCA. Until migration to full or in house smart, the TCA is not required to become a direct member of ITSO; ISL will take on such responsibilities. For AMS and HOPS, functionality is provided to the TCA by ISL; all costs for services provided by ISL (section 4.6) are therefore borne by ISL funded by DfT.

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4.6 What does ITSO Services Ltd do for TCAs?

Any organisation issuing ITSO based smart passes needs as a minimum to be an ITSO member, have an ITSO operating license, to obtain a unique identity (an OID) and to register products.

However the Concessionary team at DfT charged with implementing ENCTS wish to ensure that non-smart TCAs are not penalised for implementing smart concessionary pass solutions and are not discouraged from subsequently using the smart element either by administrative or financial barriers. This also includes a desire that "non-smart" Travel Concession Authorities should not need to have an in-depth knowledge of smartcards or be involved in ITSO, to fulfil their ENCTS obligations. With this in mind, the DfT has been working with ITSO to develop a mechanism for a new company to support those non-smart authorities and for that company to meet the ITSO requirements on their behalf.

So to achieve this and the tight timescale of the ENCTS implementation ITSO via a separate legal entity, ITSO Services Ltd has been looking at providing certain services and facilities for the DfT and the non-smart Travel Concession Authorities. These services include;

- *Membership of ITSO*
A single membership of ITSO (by ISL) to represent all the non smart authorities who will join ISL as their representative body.
- *Licensed Operator*
ISL to be the ITSO Licensed Operator and thus facilitate the operation of ITSO concessionary pass issuing by registering shells, products etc on behalf of the authorities.
- *User support/training*
One stop shop for ITSO support issues for the "non smart" Travel Concession Authorities.
- *ISAM provision*
Procurement of ISAMs for pass issuing and other services.
- *ITSO Asset Management (AMS) service*
ISL as the Contracting Authority for the required AMS to service pass issuance and other ITSO based activities.
- *A Concessionary Transaction Collection (CTC) and a Concessionary Transaction Depository (CTD) service*
ISL as the Contracting Authority for TCT/CTD Services. i.e. when a non smart TCA issues a pass and when this pass is used in a smart area transactions will be created. This service will act as the back office for the non smart authorities and will collect and store these transactions which will be held in the form of shell and product accounts.
- *Hot list processing*
To agree a process and then administer hot listing of cards (passes) and the products contained therein on behalf of the non smart authorities.

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- *Customer Help desk*
Provision of a second line help desk to support Authority help desks in end user support and certainly for the Authorities themselves relating to ITSO queries.
- *Testing service*
The current DfT proposals for the Framework Agreement with suppliers includes Batch sampling of card production. This is likely to be done in conjunction with the ITSO certification process.

4.7 Why you can't just issue the cards and do nothing else!

Smartcards have been around for some time but it is only now that they are beginning to be used seriously in UK transport applications (e.g. Oyster[®] in London). This is probably because the business case for the cards – whether they are transport cards or Citizen cards - is being kick-started by Local or National Government funding. Until now, smartcard schemes have been considered expensive for stand-alone transport applications. But the economics change, particularly if the card itself is shared (multi-application cards) and the cost of the smartcard infrastructure is potentially funded by third parties.

The benefits which can be derived from smartcards include:

- Additional data for apportionment and reimbursement of concessionary schemes
- Better data about customers and their travel habits¹
- Automated validation of the ticket, which opens the way to offer more sophisticated ticket types
- Protection against fraud, such as forgery or pass backs
- The potential for electronic money to reduce theft and operational costs and make the cards themselves more attractive to their holders
- The reduction of ticket purchase queues and journey times through faster access.

However, to-date smartcard schemes have not been commercially viable – the business case at best was poor. It is now possible to share the card (and the infrastructure) between a number of applications, such as concessionary travel, library and leisure applications, on a multi-application smartcard. This improves the business case, and major funding of concessionary travel schemes by the DfT has also 'kick started' the growth in schemes that is now happening.

Once your ITSO system is installed and running then there are many opportunities to use it in other ways:

- Scholars' cards;
- Multi-operator tickets and travel cards;

¹ Even where alighting is not monitored, the near 100% boarding sample enables more accurate assessment of travel patterns, particularly if trip pairing is introduced.

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- In conjunction with citizens card functions such as library and leisure access. Scholars' cards can be implemented with minimal additional investment once ITSO has been implemented. Basically, all that is involved is the additional cost of the smartcards themselves over and above the cost of any existing solution. The benefits are so powerful that we have assumed in the business case that scholars cards will be implemented.

The ITSO system allows both Travel Concession Authority-promoted multi-operator tickets and operators' own tickets to be implemented at low additional cost. For multi-operator ticket types the benefits are fraud prevention and the provision of accurate data for revenue distribution. For single operator ticket types the primary benefit is fraud reduction. Smartcards are of course much more reliable than the magnetic tickets already in use with some operators.

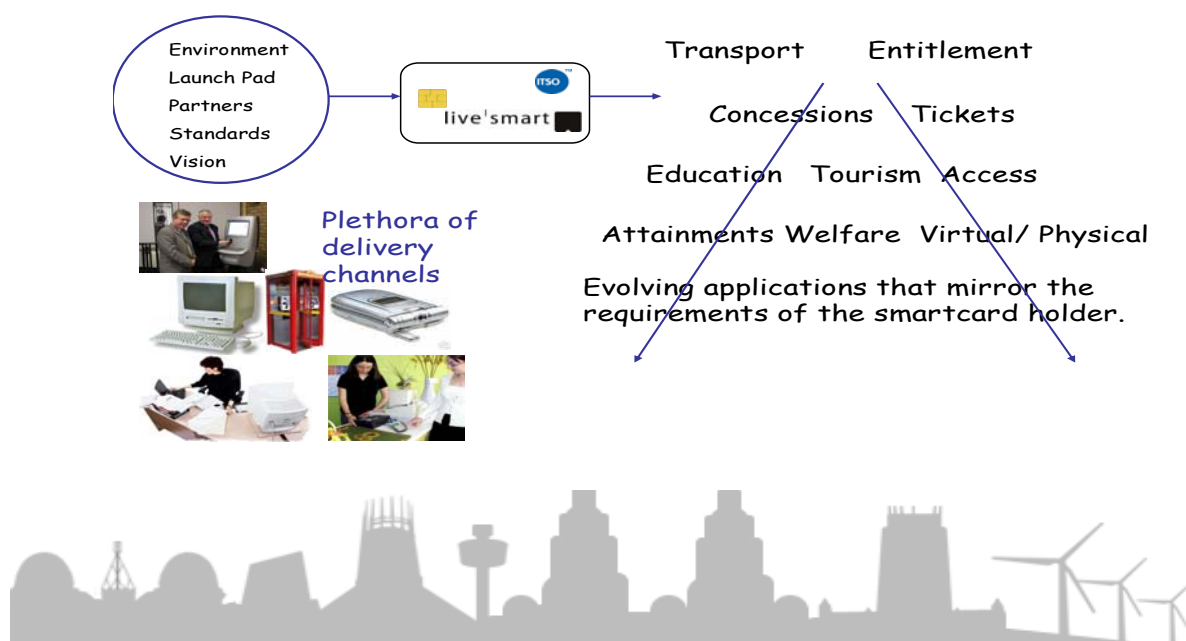
The same smartcard and much of the infrastructure can be used for citizens' cards, reducing costs by sharing infrastructure and costs.

There is a vision of where the smartcard world is going; one card in your pocket combining many functions. Transport kick-starts that opportunity and improves the business case for all local authority applications if these are implemented in a progressive fashion.

Figure 9



Vision – becoming reality



The Framework Agreement allows TCAs to forget about the details of ITSO membership and to concentrate on issuing the cards for April 2008 but ITSO Services Ltd will not be available to a TCA once that TCA implements or joins a

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scheme and goes fully smart. Instead ITSO Services Ltd will arrange for the historic data they are holding for the future scheme to be exported to the schemes new data base provider. This will be the current Shell and product accounts – in non technical terms – the details of the cards that were created and the transaction history for those cards.

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5 GOING FULLY SMART – THE SCHEME COMPONENTS

This section looks at what has to be done to become fully smart after April 2008.

5.1 What equipment will you need for a fully smart scheme?

Non-smart TCAs will already have issued ITSO ENCTS cards to their concessionaires, and will have the equipment, or will have purchased a service, to issue those cards in the future.

An ITSO ENCTS card is one compliant with the ITSO Specifications; that is it is based on an ITSO approved smartcard type (Customer Media in ITSO speak), and is compliant with the DfT's guidance for ENCTS cards. It will be programmed with an ITSO Shell, which can be regarded as an envelope within which various ITSO Products can be stored. The shell will contain a card holder identity and entitlement product, which is used to store the ENCTS entitlement. For security reasons the product contains an electronic ITSO Seal, which can be used to verify its validity.

To go fully smart, two more systems are required:

- ITSO compliant Electronic Ticket Machines (ETMs) installed on buses and the associated support (depot) systems; and
- back office systems including a Concessionary Pass Management System, a Service Operator Reimbursement System and an ITSO certified Host Operator Processor System (HOPS) with an Asset Management System (AMS).

Bus Equipment

Most bus operators will already be equipped with Electronic Ticket machines (ETMs). These systems need to be updated to handle smartcards and to communicate with the HOPS in a way that is compliant with the ITSO Specifications. In many cases older equipment will have to be replaced with the latest generation equipment in order to achieve this.

ETMs that are compliant with the ITSO Specification are known as Point of Service Terminals, or POSTs for short. They will contain an ITSO Secure Access Module known as an ISAM. This is a security device which provides for unique identification of the POST, stores the secret keys supplied by the ITSO Security Management Service (ISMS) and provides the cryptographic functions needed by the POST. This combination of unique identity and cryptography allows the source of all transactions to be positively identified and reimbursement to be properly directed.

Smaller operators who currently do not have ETMs will also have to be upgraded to use them. Some existing schemes have minimised the cost impact of this by forming a "club" whereby small operators can share a depot system. This facility can be operated either by a Travel Concession Authority or by one of the operators.

As an alternative to fixed ETMs, portable equipment can be used on certain vehicles such as coaches that are occasionally used for school runs and on which it is undesirable to install fixed equipment.

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All equipment capable of either verifying the ITSO Seals on Shells and Products or of creating or modifying ITSO Products, must be certified by ITSO as a POST. It is the bus equipment supplier's responsibility to achieve certification and the Licensed Member's responsibility to ensure that all relevant equipment is certified.

Apart from the on-bus equipment, depot computer systems are also required. These are used to create configuration data and fare sets, and to retrieve and analyse ticket sales data. In the ITSO environment they also serve as a data communications channel between the ETMs and the HOPS passing through ITSO messages without processing them. For this purpose a secure internet connection is used. The depot system will have to be connected to the internet using a broadband or ADSL connection. Because of the risk of intrusion from the internet, protection such as a firewall is required.

It should be noted that the sending of data to the HOPS does not mean that all of a bus operator's data will automatically be transmitted to the back office. The ITSO system is designed such that each data item is only transmitted to those entitled to receive it.

Depot systems do not have to be certified by ITSO but in many cases they will be replaced when the new ETM system is installed. Occasionally it may be possible to simply upgrade software on an existing system where existing ETMs can be upgraded to ITSO compliance.

ETMs have traditionally been owned by bus operators and are a critical component in their business. Operators will understandably have strong views on this matter and TCAs will need to work in close partnership with them. ETM systems are available from a number of suppliers. Operators will want the final say on whose equipment and the specification of that equipment to be installed on their vehicles.

Because of the complications of ownership, there are a number of funding and procurement routes which are decisions for the TCA's policy makers. The ETM procurement may well be conducted by bus operators, with the TCA specifying the minimum features required for successful operation and acting as a facilitator. Alternatively the TCA may conduct the procurement process and provide equipment to the operators.

The TCA may fund all, or none, or part of the ETM procurement. Some TCAs have funded just the ITSO element of the ETM whilst others have funded the ETM configuration necessary to support the TCAs concessionary products. In some cases a grant has been given towards the cost of the equipment.

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The Back Office

The back office comprises four main elements:

- the HOPS;
- the AMS;
- a Concessionary Pass Management System; and
- a Service Operator Reimbursement System.

The **Host Operator Processing System** or **HOPS** is the ITSO certified component of the back office. It is a database storing details of ITSO Shells and ITSO Products created by the Licensed Member and provides for creating and managing Hotlists and Actionlists.

An important function is handling messages received from ETMs and from other HOPS, and transmitting messages to POSTs and other HOPS. When it receives messages from ETMs destined for other Licensed Members (known in ITSO as “not on us messages”) it will automatically transmit those messages to the appropriate HOPS. This will occur (for example) when a concessionaire from another area travels on a bus in your area.

The HOPS also stores summary details of other Licensed Members ITSO Products, for example a ticket type for a journey which is not a Concessionary Journey which has been loaded into ITSO Shells issued by you. This information, together with the listing of Licensed Member details provided by ITSO, is invaluable when answering customer queries. It will be used by your help desk to redirect calls to Product Owners when necessary.

The database of ITSO Shells and Products is automatically populated when creation messages are received from card issuing equipment (known as Personaliser POSTs).

The HOPS receives and stores records of Pass usage at ETMs, which are available for management reporting and for transmission to a bus operator reimbursement system. HOPS systems are available from several suppliers, either as a package or as a managed service. To date all systems sold have been on a managed service basis.

The **Asset Management System** or **AMS** is a component of the HOPS and must be certified by ITSO. Conceptually it can be separated from the other HOPS functions but in practice, to date, all implementations have combined all the HOPS functions together with the AMS into a single unit.

The AMS is responsible for managing the ISAMs in your system and the security keys issued by the ISMS. It can be used to download security key files from the ISMS, and to configure ISAMs. This is not a straightforward process and procurement on a managed service basis from an experienced provider has merit.

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The AMS is available from the HOPS suppliers either as a package or as a managed service. To date all systems sold have been on a managed service basis.

The **Concessionary Pass Management System** is fundamentally a database of concessionaires. It is used to hold: names; addresses; details of entitlement; expiry dates; and other data. It also lists all the smartcard-based Passes issued to concessionaires and has electronic links to data held in the HOPS and to computer files containing photographic images of concessionaires. In essence it performs the same function as the “Card Management Service” provided under the DfT’s framework agreements.

ITSO does not specify any element of the Concessionary Pass Management System and the database can be of any design to suit the scheme owner’s needs.

It should provide for data entry and maintenance, update of concessionaires details, help desk enquiries and the output of data and photographs for bulk and occasional new and replacement issuing of Passes.

The same management system should be able to support scholar and citizen cards, which are easily provided once the ITSO system is up and running.

The **Service Operator Reimbursement System** is used to calculate the financial reimbursement due to operators based on records of Pass usage obtained through the HOPS.

ITSO does not specify any element of the Service Operator Reimbursement System and the system can be of any design to suit the scheme owner’s needs.

It should be noted that unless concessionaires are required to touch their Pass on a reader when alighting from the bus, smartcards only reliably record boarding points. Some TCAs have implemented systems which require the concessionaire to state their destination and the driver must enter this on the ETM, but of course the accuracy of this information relies on the accuracy of both the concessionaire and the driver and a boarding time penalty is also likely to be incurred if such a system is specified. Both boarding and alighting point information accuracy depends upon the accuracy of any manual fare stage updating system used. Clearly automatic fare stage updating provides higher quality data.

All of these systems should be capable of providing Management Reports.

Optional Equipment

You may choose to provide other ancillary systems and equipment, including portable handheld readers for revenue protection inspectors, and “kiosk” style information and help points for card holders. Neither of these are essential to the operation of your system but may help provide better services. They are available from a number of sources but only need to be certified by ITSO if they are capable of verifying the validity of ITSO Products or of modifying card contents². To achieve either of these functions the equipment needs to be fitted with an ISAM.

² Modification of card contents includes blocking Hot listed cards and decrementing multi-use ticket products.

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5.2 What else do you need to arrange?

ITSO Membership

Membership of ITSO is a prerequisite for any ITSO activity and opens the door to participation. As a member, a TCA will receive information on ITSO's activities and will be able to influence its direction. Members are entitled to vote for sector directors to represent them on the ITSO board and to attend general meetings (normally held annually). A current list of ITSO directors by sector is attached at the end of this guide and is also updated as applicable on the ITSO web site.

There are both joining and annual fees for membership, which are on a sliding scale according to population for Local Authorities and are fixed for PTEs.

Copies of the membership agreement and details of the fee structure are available on the ITSO web site www.itso.org.uk.

ITSO Operating Licence

The ITSO Operating Licence is an agreement between ITSO and another body (who then becomes a Licensed Member), allowing the Licensed Member to operate an ITSO system, create ITSO Shells and ITSO Products and to operate a HOPS and POSTs.

This is a comprehensive agreement, placing obligations both on ITSO and on the Licensed Member. It includes service level details for the services provided by ITSO, including the ISMS.

There is a variable scale fee structure which aims to reflect the Licensed Members level of usage of ITSO. ITSO provide a fees calculator on their web site so that fees may be easily estimated. Fees, one-off and annual, are based on:

- ITSO related turnover;
- ISMS operational fees;
- The number and type of ITSO entity identity numbers required (OIDs);
- The number of ITSO Shell and ITSO Product types registered with ITSO; and
- The turnover related to registered ITSO Products.

There are also one-off fees for the "know your customer" process, by means of which the ISMS operator establishes the identity of the Licensed Member's authorised staff.

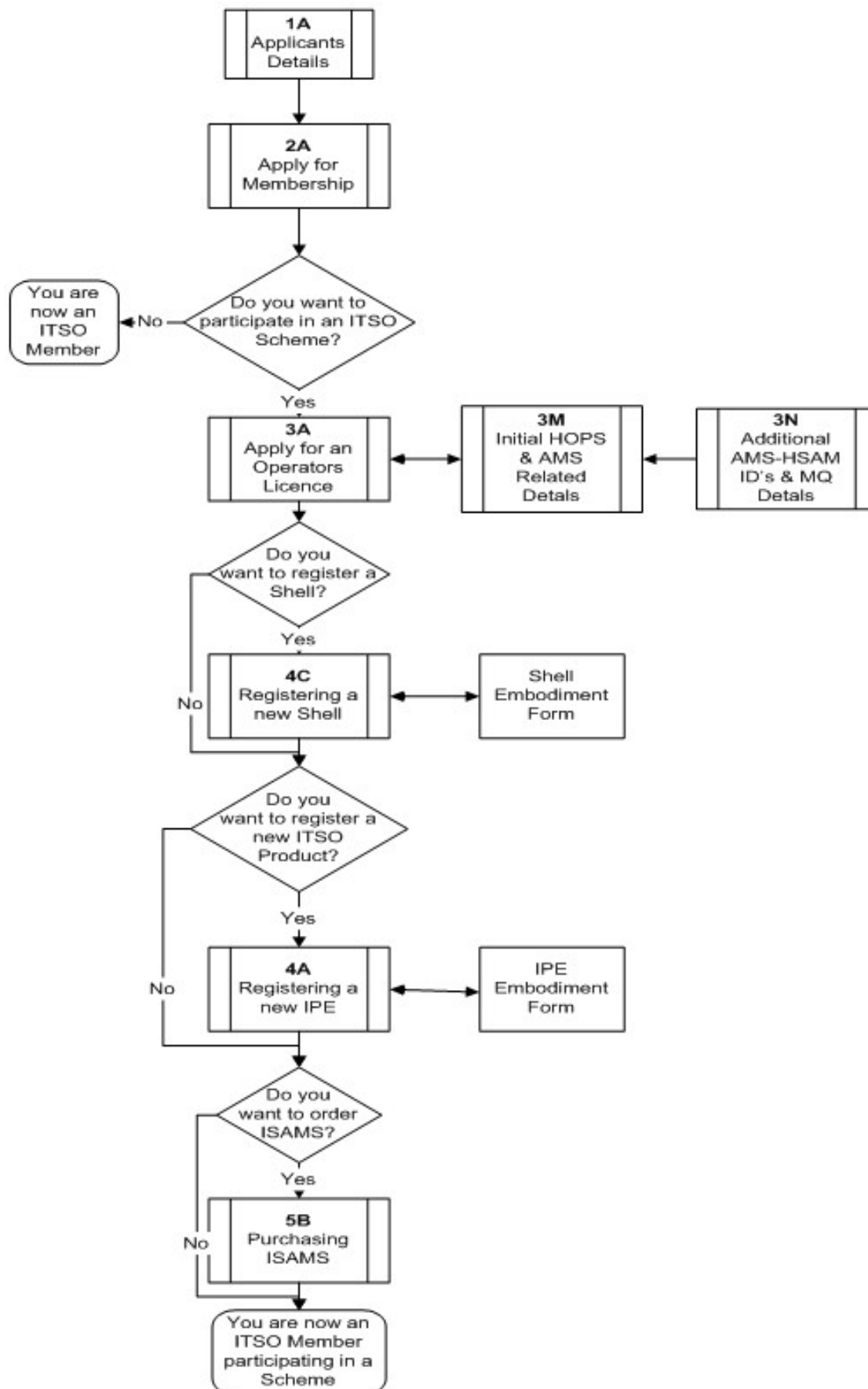
Copies of the licence agreement and details of the fee structure are available on the ITSO web site www.itso.org.uk.

ITSO Processes

The following flow chart, figure 10, depicts the procedures that you may need to undertake in joining ITSO and the various additional applications to ITSO that you may wish to make depending upon what roles you plan to perform within the ITSO environment. The Application Forms shown are all contained within the ITSO major Forms handbook which is available as a download from the ITSO website www.itso.org.uk

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Figure 10 – ITSO Process



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Bus Operator Agreements

Formal agreements with bus operators are extremely useful and are an obligation under the ITSO Operating Licence.

Some of the Licensed Members obligations under the ITSO Operating Licence apply to bus operators and this agreement should place these obligations on the operator.

The agreement could also usefully cover:

- Provision and funding of equipment and software: ETMs and depot systems;
- Data sharing: what data may be shared and what it may be used for;
- Obligation to transmit agreed data in full and within agreed timescales; and
- Customer (Concessionaire) care.

Supplier Agreements

A robust supplier agreement will help prevent or resolve disagreements later on. It should also be used to pass on Licensed Members obligations under the operating licence. These include the requirement for equipment to be certified by ITSO, and for maintenance of that certification for a defined time period.

Partner Agreements

If you have entered into a partnership with other TCAs to provide the full ITSO scheme, a formal agreement between the partners is highly recommended. Typically one TCA will take the lead and become the ITSO Licensed Member. The partner agreement should be used to pass on the Licensed Members obligations to the other partners.

Help Desk

A requirement of the ITSO Operating Licence (derived from the requirements of the Data protection Act) is that you provide a customer help desk, and that the help desk phone number is printed on cards you issue. The phone number must be provided to ITSO so that it is available to other Licensed Members. Your help desk should be prepared to handle:

- Phone calls about your own cards, ITSO Shells and ITSO Products; and
- Phone calls about other Licensed Members ITSO Products which have been placed in your ITSO Shells. You need to be able to forward these calls to the appropriate Licensed Members help desk for resolution.

5.3 The operators viewpoint

As previously mentioned, bus operators typically own and operate the ETMs which are vital to their business operation. More than this, their staff are in the front line dealing with concessionaires on a daily basis.

We strongly recommend involving the operators early on – there are positive benefits for them which are outlined below. However, they will also bear much of the burden of installation, commissioning and dealing with the public when operation starts.

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Forming a close partnership with the operators from the outset is therefore fundamental to a successful scheme; they are key members of the scheme delivery team.

There is great merit in involving the operators, from the outset, in the specification of those elements of the scheme (hardware, software, operating and reporting systems) that will affect bus operators. This will introduce an element of practicality and operating experience to the specification and make the resultant system much more successful.

Likewise getting operators' input on proposed communications with concessionaires before publication will benefit all parties by ensuring a consistent approach. Information provided to concessionaires must be consistent with the training provided to bus operator staff if confusion is to be avoided. Operator staff training is a vital component of a successful scheme and again a joint approach is worthwhile. It should be noted that training all the drivers in a large company can be quite time consuming so training needs planning well in advance.

When introducing the scheme to bus operators it is worthwhile mentioning the potential benefits from adopting smartcard ticketing. These include the following:

- The number of concessionary journeys is accurately recorded and the length of journeys may be estimated from the ETM data to provide a sound basis for reimbursement.
- ITSO allows the introduction of ticket types and loyalty schemes that would be neither practicable nor reliable without smartcards, including electronic purse type products and multi-ride products.
- Counterfeit tickets are made extremely difficult to produce, and invalid tickets can be cancelled remotely using Hotlisting.
- It has been observed that if the scheme is extended to scholars, then the children will be better behaved and vandalism reduced. This is because the cardholders are aware that they are known to be travelling on a particular vehicle.
- Subject to the provisions of the data protection act, ETM data can be used to gain a detailed knowledge of passenger travel patterns. This information can be used to plan better services.

It was noted above that counterfeit tickets are extremely difficult to produce; however, there will be new types of attempted fraud with the smartcard system. While the electronic checks of the smartcard are extremely difficult to circumvent to the point of virtual impossibility, fraudsters will attempt to exploit the human element in the system, i.e. the driver. The apparent concessionaire may claim that their card is faulty when in fact they are not entitled to it, or the card has been Hotlisted or Blocked. There will be attempts to discredit the system so that drivers can be persuaded to allow travel with invalid cards. People will deface a card which they have found or stolen and attempt to use it for travel. Driver training and procedures should be developed to cover these situations. However, it should also be noted that fraudsters will always be testing the system and trying new types of fraud. All parties must be prepared for new types of fraud to arise, and to eliminate these frauds. In

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this regard sharing experience with other authorities and ITSO Services Ltd will help everyone.

Handling Abnormal circumstances

We have already mentioned the importance of staff / driver training and of robust procedures. Nowhere are these more important than when handling abnormal circumstances. Things will inevitably go wrong on-vehicle from time to time and processes and training are needed so that staff are equipped to handle situations as they arise. There needs to be clear understanding and agreement on what to do when things do go wrong, in circumstances where the system, the card or the passenger do not behave as intended.

Ideally common practice will be established so that all schemes treat abnormal circumstances in a uniform manner. Achieving this is the responsibility of the scheme owner.

In an ideal world all operators would be fitted out with ITSO smartcard ticketing equipment, the equipment would function perfectly at all times and all cards presented would be genuine and the property of the presenter. Were that to be the case the operator's and in particular, the driver's job would be permanently lightened by passengers merely touching their smartcard to record a fare or concessionary transaction. However, not all operators can be fitted out with the appropriate equipment by April 2008 and, as is known from long experience, ticketing equipment can be expected to fail to function correctly and not everyone claiming to be is a genuine concessionaire.

In order to minimise the occurrence of confusion and inconvenience for the genuine passenger and opportunities for conflict, there is merit in providing drivers with recommended and appropriate procedures, applicable nationwide, to be followed when foreseeable circumstances arise. In particular, the circumstance where a passenger might attempt to use an ENC smartcard in order to travel free of charge on a bus, but for a number of reasons will be unable to complete the boarding transaction using their concessionary card.

The following examples are circumstances that could arise and for which procedures should be developed:-

- The ENC smartcard has been tampered with
- The ENC smartcard does not belong to the person presenting it
- The ENC smartcard has been Hotlisted
- The pass or permit within the ENC smartcard is no longer valid
- Where the passenger claims a Concessionary Pass is encoded in the card but the reader is unable to detect its presence
- When "Passback" is detected
- When a visually valid ENC smartcard is faulty and cannot be read electronically.

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Withdrawal of cards that are suspected of being misused is likely to be practiced in many areas. A consistent procedure to ensure their traceability for the benefit of both passenger and driver seems necessary especially where concessionary journeys are taken outside the cardholder's area of residence.

Circumstances leading to withdrawal might be where the image on the card is damaged beyond recognition, where the image on the ENC smartcard is not of the person presenting the card or where a Hotlisted card has been touched on the ETM reader. Also to be considered is how to deal with a transaction that has taken place in these circumstances and how to deal with the person presenting the card.

Situations are likely to arise causing the reader to indicate that the card presented is not valid or not valid for the requested journey. This could be because the pass has expired or it is not valid for the time of day or 'passback' has occurred. 'Passback' is detected by the reader when a subsequent transaction is attempted within a short time of an earlier transaction. In each case a recognisable driver response would help passenger understanding.

It is inevitable that drivers operating smartcard equipped ETMs will be faced with faulty smartcards. In most cases the reader will not even register that a card has been touched but some cards that have been subjected to data corruption might cause a reader response. Such a response will indicate an invalid card. Visual validation provides satisfaction for the passenger who should be advised to get a replacement card. However, the driver needs a means of recording that a concessionary journey took place which might call for an ETM function that allows it. In addition, attempted fraud by presenting a dumb card or by deliberate damage to the card needs to be considered so that drivers are able to give a consistent response.

5.4 Size does matter – trials are passé

Over the last 15 years there have been many trials and pilots of smartcard technology as public transport tickets both here in the UK and elsewhere. These have all been overtaken by the many fully operational schemes which have been implemented. These include the following schemes:

- London's Oystercard;
- ITSO implementations in Cheshire, North West England (Nowcard), Nottinghamshire, and Scotland. Of these all but the Cheshire system are implementing concessionary fares;
- Earlier non-ITSO implementations in Hertfordshire, Nottinghamshire and Northern Ireland.

The technology and systems are therefore well proven and it is the authors' view that technology trials are not necessary.

However, we would recommend a phased and considered introduction, with comprehensive system testing at each stage, agreed in conjunction with bus operators. A careful implementation will reduce the risk of serious disruption and inconvenience to both operators and concessionaires. We envisage the following

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phases incorporating rigorous and comprehensive testing, allowing any issues to be resolved before they cause serious difficulty:

- Procurement;
- Implementation and commissioning of the back office;
- Testing in a non-live environment;
- Installation and commissioning of the bus equipment and depot systems at a single “pilot” operator;
- Testing of the full system using test cards;
- Go live with the pilot operator;
- Testing of the system in the live environment;
- Rollout of bus equipment and depot systems to other operators;

5.5 Timescales

Introduction

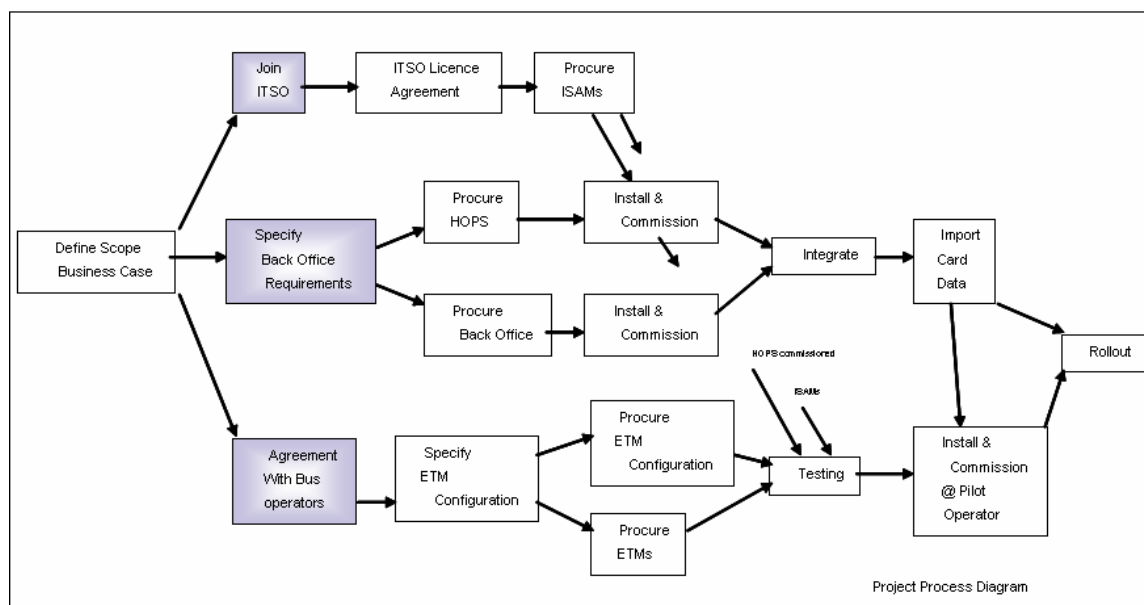
This section looks in outline at the typical timescales that a Travel Concessionary Authority should expect for the procuring of equipment, services, and for the setting up a fully smart scheme. All timescales are based on experience to date and should be confirmed with suppliers. In particular it should be noted that if there is a rush of TCAs setting up schemes, suppliers may be stretched and timescales may inevitably become longer. It is a sad fact of life that the unexpected always happens and that building contingency time into the project plan will help to offset such unforeseen events.

It is also our experience that time spent in clearly defining the requirements of all users of the system pays dividends when testing begins to yield results and roll-out starts.

It is assumed throughout that TCAs have already issued concessionary passes. However, the re-issue of cards and card issue to new applicants may be an activity which can be integrated into the scope of the scheme and into the back office facilities.

The project process is outlined in the following diagram with some of the various activities being further discussed in the subsequent few paragraphs.

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Some activities may be able to be worked in parallel and reduce the overall project timeline, but each TCA will need to assess their own approach and create a detailed project plan to identify their best and realistic Business Case and Timeline for their particular implementation. The remainder of this document reviews (at a high level) the major implementation blocks on the above diagram and provides some options and approximate timescales that TCAs might wish to consider when building their plans.

Defining the scope of the scheme and approving a business case

This initial phase consists of reaching agreement with partners; identifying funding sources and resources; determining the technical scope and ball park costs, putting together a business case and gaining all necessary approvals. While hopefully this document helps in this process by outlining much of what is needed, this stage can still take a surprisingly long time. Two to six months are typical, but it can easily take longer.

ITSO related activities

Joining ITSO is a precursor, following which you can become a licensed member. At least three months should be allowed, while joining is straightforward, becoming a licensed member is more complex and time consuming as TCA legal departments will wish to appreciate the obligations imposed by the license. The licensed member agreement includes applying for and registering your AMS, OID(s), ITSO Shells and ITSO Products.

ISAMs are procured from ITSO, and are only available to licensed members. The lead time varies according to the stock situation, if there is no stock then the lead time is ten to twelve months. Clearly if there is stock then ISAMs are available almost immediately.

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5.6 Procuring the Back office

There are three elements to the back office;

- HOPS/AMS,
- Customer/Card management system,
- Settlement and reimbursement system.

You may be able to procure all three elements from a single supplier, you may prefer the products of several suppliers, or you may already have a customer/card management system which can be adapted. The advantage of a single supplier is that they will take full responsibility for delivery of an integrated system. If multiple suppliers are involved then an integration stage within your project plan will be necessary; this will be the point where all the elements are brought together and tested as a whole.

You should allow a period of one to three months to develop your requirements and produce a specification. While it is tempting to regard the HOPS/AMS as an off the shelf product, other elements are less well defined. Furthermore it is always good practice to develop a good understanding for what you want the system to do before placing contracts, in what is after all a reasonably sized IT procurement project.

There is a time overhead to the procurement process you use. For example, using the EU procurement process will add at least three or four months to your timescales. An internal process may be quicker.

- If you procure a HOPS/AMS as a managed service from an existing ITSO certified supplier, then a lead time of two to six months for a fully commissioned service would be typical
- If you install a system from an existing certified supplier in house then longer should be allowed
- If you commission a new implementation from a new supplier, then one to two years should be allowed, subject to the supplier's commitment on timescales.

Similarly with the customer/card management system and the reimbursement system;

- Procuring managed service based systems from an existing supplier should take from three to six months, nine at the outside
- Installing the system in house will take longer
- Procuring a new system from a new supplier will take the longest.

Installation and commissioning will be quickest for a managed service and is included in the timescales outlined above. In other cases allow one to three months.

Testing will take at least one month, with another month allowed for defect rectification and further testing. Allow one to three months for integration testing and problem rectification if multiple suppliers are involved.

Finally you will need to import your customer, card and ITSO data sets from the systems which have held it to date. This may be a service provided under the DfT's framework agreement. This is presently an untried process and therefore the first

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schemes to do it should expect delays. However once the process is established then two to four weeks, with a six week advance notice period, would seem reasonable.

5.7 Procuring the ETMs

Your system may well involve ETMs from two or more suppliers. If this is the case then the following activities need to be repeated for each supplier.

You will need to reach agreement with the bus operators on the method of procurement, ownership and funding. Ideally you will have started this process early, and incorporated the necessary contractual elements into the concessionary fares agreement. Negotiations and legal reviews can be very time consuming, easily taking three to six months.

The ETMs need to be configured for your system, allow one to three months to specify this.

If you procure the ETMs directly then there is a time overhead to any procurement process you use. For example, using the EU procurement process will add at least three or four months to your timescales. An internal process may be quicker. If operators procure the ETMs themselves then this stage can be avoided.

ETM procurement comprises two elements, creation of the ETM Configuration and procurement of the ETM hardware and software. Creation of the configuration is currently taking around 20 weeks from order. ETM lead times are currently around four months from order.

Following delivery of a test system (and before installation) you will need a testing phase. Allow at least two months to fully test that the configured ETMs meet your requirements, and for rectification of any defects. Note that this process can sometimes take a considerable time.

An integral part of the ETM commissioning process is driver training. This can be a time consuming activity particularly at large operators and needs careful planning. It should be started as soon as test systems are available.

Following testing we recommend installing & commissioning an ETM system at a pilot operator. This installation should be monitored closely, any problems identified and process lessons learnt. Two to three months should be allowed for this activity.

Following successful commissioning at the pilot operator a system wide roll out process can be undertaken to install & commission ETMs. Three to four months should be allowed depending upon the suppliers' delivery timescales and the number of operators involved.

6 GOING SMART – CONSTRUCTING A BUSINESS CASE

This document does not attempt to produce a business case for a TCA, each TCA's business case will be unique, tailored to a TCA's particular requirements. Instead this document outlines the various benefits, costs and funding areas for consideration, discussion and inclusion in a Business Case

6.1 Benefits of a fully smart ITSO scheme

There are a number of benefits arising from a fully smart ITSO scheme, benefiting either the TCA, bus operators or both. Some benefits only arise if additional investment is made, for example where scholars' cards are implemented.

1. Detailed records of journeys made with each card are created by ETMs, each attributable to an individual card, providing an accurate record of journeys commencing, and an estimate of journey length:
 - This allows for data record based reimbursement and revenue distribution, reducing the need for, or even eliminating surveys and reducing the need for management of disputes
 - Subject to the data protection act, detailed cardholder travel patterns can be used for route and timetable planning, making for a better fit between users needs and the services provided
 - Ticketing innovations are made possible, because the combination of a smartcard and reliable data allows for revenue distribution to take place. For example period tickets can be replaced with discounted bulk purchase or capped fares schemes, attracting more users to the bus network
 - For similar reasons the smartcard system supports more widespread multi-operator, multi-modal through ticketing
 - Particularly if scholars cards are implemented, the data provides for identification of vandals and troublemakers, reducing the cost of vehicle maintenance in the long term as the level of incidents reduces
 - Payment innovations are made possible, because of the combination of a smartcard and reliable data. For example, card linked direct debit, or stored value (similar to an e-purse). When combined with a ENC pass the concessionaire could travel both in and out of the peak period by one touch of their card, any fare due in the peak being automatically deducted from the stored value in the card.
2. An ITSO card is a far more secure pass/ticket artefact than previous cards, which when combined with the security of an ITSO system will very significantly reduce fraud costs:
 - Concessionary passes and tickets are very much more difficult to counterfeit

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- Very high integrity of data exchanges between ITSO licensees giving great confidence in the data and thereby reducing audit and dispute resolution costs.
- 3. The ITSO system provides for automated hotlisting and cancellation of lost and stolen passes and tickets, significantly reducing the costs associated with fraudulent use of those cards.

The driver's task is simplified because most pass validation is conducted automatically by the ETM. The cardholder photo image is inextricably tied to the cardholder's entitlement, reducing the chances of misuse.

- 4. New ticketing products and payment methods made possible by smartcards could lead to reductions in boarding times and to the amount of cash taken on-bus. If the total amount of cash is not reduced, there should be a swing away from low value change towards higher value notes possibly reducing cash handling costs.
- 5. Note that boarding time reductions are dependant upon system and ticket product design, which needs to be carefully considered at the outset if the benefits are to be realised.
- 6. Automated action list processing allows for passes and ticket renewals to be conducted remotely, on bus or at a kiosk, significantly reducing operating costs. A renewal can be done by phone or on the web, and the update conducted on bus. In a similar way stored value and multi-ride products can be topped up remotely
- 7. Cash flow benefits may be achieved
- 8. When a local authority wishes to introduce citizen cards, then substantial savings can be made by combining the ENC/ITSO and citizens card projects, compared to introducing the two cards separately. Much of the back office and card issuing infrastructure can be shared, as well as sharing a single smartcard.

From a wider Local authority viewpoint there are also 'political' advantages;

- 1. Transformational Government and its emphasis on shared services
- 2. Gershon efficiency savings, both cashable and non-cashable
- 3. Disability Discrimination Act compliance for e-enabled services
- 4. Citizen Identity Management and the use of Government Connect
- 5. Modernisation of public services and the delivery of e-Government
- 6. Meeting the DCLG's Priority Service Outcomes

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6.2 Cost Elements

In this section the cost elements associated with implementing an ITSO system are reviewed.

Cards

It is assumed that TCAs will already have issued cards. The cost of cards and card issuing systems is therefore not discussed here. There will however be an ongoing cost for issuing cards to new concessionaires and re-issuing lost, stolen and faulty cards. These can either be procured on a managed service basis, or equipment can be procured and the cards issued in house.

Hardware, software and systems

There is substantial investment required in electronic ticket machines (ETMs), the associated depot systems and configuration software. As previously discussed these costs may be shared with the bus operators.

You may choose to provide revenue protection and inspection equipment in the form of hand held readers. There is a capital cost for these and for the associated depot equipment.

You may choose to procure and operate the back office system in house, or to procure a managed service, or to operate some elements in house with others procured as a managed service. The following elements would attract capital cost if operated in house:

- ITSO, HOPS & AMS;
- Card and Concessionaire management system;
- Transaction processing, & reimbursement calculation; and
- Financial accounting functions.

The ITSO Secure Access Modules (ISAMs) are procured and paid for by the Licensed Member, i.e. the costs are additional to the equipment costs. They are procured through ITSO. A sufficient quantity should be procured to cover:

- one per ETM plus a small number of spares;
- one per inspectors reader if the inspectors reader functions require an ISAM;
- one for every item of equipment capable of issuing cards, including those at a bureau or managed service company's premises; and
- a quantity for use in the HOPS/AMS – the chosen supplier will advise the quantity required.

Managed service alternatives to capital purchase

Some back office elements are available as a managed service, including:

- the HOPS and AMS; and

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- Card and concessionaire management system.

If the managed service option is taken then there may be set up costs, together with charges based on usage of the service.

Essential services

ITSO membership fees are on a sliding scale depending upon population for local authorities, and fixed for PTEs. There is a joining fee and subsequent annual fees. Details may be found on the ITSO web site www.itso.org.uk.

ITSO license fees include all operating fees due to ITSO. The amounts will vary according to the size and scope of your ITSO scheme. There are initial and annual fees. There is a calculator on the ITSO web site.

The telephone help line will require funding. It may be possible to use an existing help line but there will be costs associated with providing access to ITSO system data and operator training.

There will be data communications costs covering data links between:

- bus operators depot systems and the HOPS;
- the HOPS and your back office if the HOPS is outsourced;
- the card issuing facility and your back office and the HOPS.

ITSO systems typically use secure communications over the internet, so the cost is that associated with installing a high speed internet connection and suitable modems, routers and firewalls. Sometimes it is possible to use an existing internet connection thus saving cost.

Marketing/public information

There should be a budget for a public information campaign and it is essential to involve your operators in the design process.

Project Management, Staffing and resources

An ITSO implementation project will require project management and technical support. Legal and procurement specialist skills will also be required from time to time. There will be a requirement for liaison with suppliers, bus operators and other stakeholders. You may choose to use internal resources or external consultancy support, or a mix of the two.

6.3 A Changing Situation

The recently-let rail Franchises require ITSO implementations, meaning that some of the train operators (who are also bus operators) will be procuring their own HOPS. This will change their business case and consequently their demands on TCAs who will not have to provide HOPS services to these operators, reducing costs.

With the continuing roll out of ITSO ETMs across bus fleets, the likelihood of a TCA's neighbouring bus fleets being equipped increases. This means that vehicles on cross border services are more likely to be equipped, reducing ETM costs.

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6.4 DfT Major Scheme Business Case Guidance

One possible route is to seek funding as a Local Transport Plan major scheme. One possible route is to seek funding as a Local Transport Plan major scheme. In order to qualify to apply for DfT major scheme funding, schemes must first be prioritised within the Regional Funding Allocation by the appropriate regional bodies. These will vary from region to region but the Regional Assembly would normally be the first point of contact. Government Offices can also offer advice and guidance

Further guidance on DfT major schemes is available from:

www.dft.gov.uk/pgr/regional/ltp/major/majorschemeguide

7 CASE STUDIES

The authors would like to thank Gordon Hanning at Transport Scotland and Martin Rose at Nottinghamshire County Council for their invaluable assistance in preparing these case studies.

Nottinghamshire County Council's *freedom card* Concession Scheme

Nottinghamshire is a little unusual in that, together with its District Council partners, they introduced a non-ITSO smartcard based concessionary fares scheme during the late 1990s. This was therefore one of the first concessionary smartcard schemes in the UK, and was sufficiently successful for the Council and its partners to agree to proceed with migration to the ITSO specification in late 2004, for which the Council received part funding from the DfT.

The scope of both the non-ITSO and successor ITSO systems is similar. It provides for both statutory and concessionary travel for the elderly and disabled, and for pupils and students of Nottinghamshire. The combined card holder base is in the order of 120,000 persons.

The ITSO migration project is progressing well. After a procurement exercise, Applied Card Technologies (ACT) were selected to provide the HOPS and AMS on a managed service basis. This is up and running and the Council's existing back office system has been adapted to interface to the HOPS.

ESP Systex were contracted to provide card issuing equipment, and a bureau service. Some 12,000 scholars and students cards have now been issued to users ready for the new academic year, and around 14,000 concessionary passes issued to the elderly and disabled.

The project is currently being modified to bring English National Concessions into its scope. Issue of concessionary passes to the elderly and disabled has therefore been suspended until quarter 1 2008 when all concessionaires will be issued with an English National Concession pass. It is proposed to include "top-up products" in the pass so that concessionaires may travel for half fare in the morning peak, and disabled persons companions will benefit from concessionary travel.

The non-ITSO system is currently rolled out across the majority of buses operating within the County, and these will be progressively migrated to ITSO ETMs over the next year or so. The Council are supporting use of ETMs provided by all major suppliers, including those from Almex, ERG and Wayfarer. The Council is supporting operators of tendered services by grant aiding ETM procurement. The operators are responsible for procurement and will own the ETMs they purchase.

To support some of the very small operators providing up to 6 contracted services, the Council operates an ETM depot system on their behalf. Other small operators are working together with a single depot system supporting their needs.

Work is ongoing on ETM configuration and testing, with installation at a pilot operator anticipated before the end of the year. This aspect of the project has been delayed by the need to modify specifications and ETM configuration to accommodate the

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English National Concession. It is desired that a significant quantity of ETMs will be installed by April 2008 so that usage of both local and “out of area” concessionary passes can be monitored.

Despite their previous experience with smartcard systems, and despite not being the first authority to commence implementation of ITSO, the Council still played something of a guinea pig role. The Council invested considerable resources in working with ITSO and other stakeholders to develop the ITSO licence agreement. Other areas where significant additional unexpected work was required was work undertaken by the Council’s HOPS/AMS provider to interface that equipment with the ISMS, and work undertaken by the Council’s staff working together with ESP Systex to perfect the printing and formatting of smartcards.

The Council’s partners include:

- 7 Local Authority District Councils: Ashfield; Bassetlaw; Broxtowe; Gedling; Mansfield, Newark & Sherwood; and Rushcliffe;
- 2 Education Authorities;
- 4 major commercial bus fleets; and
- 54 bus operators with 900+ contracts for education and other tendered services.

For further information contact Martin Rose, Senior Projects Officer, Nottinghamshire Transport Services, Communities Department, Nottinghamshire County Council, Trent Bridge House, Fox Road, West Bridgford, Nottingham, NG2 6BJ. or email martin.rose@nottscc.gov.uk

The Scottish National Free Bus Concession Scheme

In April 2006 the Scottish Executive introduced a Scotland-wide free bus concession scheme for older and disabled people, which has over 1m card holders making about 165m trips annually and with a budget in 2007/08 of £163m. The Scheme is run by Transport Scotland, a delivery agency of the Scottish Executive.

In announcing the Scheme back in 2005, the then Minister also signalled the government’s intention that the Scheme should operate with smartcards. Thus Scotland was propelled to the front of ITSO. The bad news is that we’re still in the midst of rolling out our smartcard programme. The good news is that in our guinea pig role we have invested a serious amount of time, money and effort, and learned a huge amount that will be of benefit to anyone else considering rolling out an ITSO Scheme. Thanks in no small part to the investment of over £1m by Scotland in exhaustive testing, the ITSO specification is now much more tightly defined and tested, and the key products such as electronic ticket machines now have software that works fully in the ITSO environment. This will make life much simpler for future schemes, which should not need to go through a fraction of the pain that Scotland has.

A few words about the key ingredients of an ITSO Scheme:

The Cards – The Scottish card is not exclusively a transport card. The government’s vision is to create a single card which contains a whole raft of applications for all

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citizens, including access to libraries, swimming pools, and school meals, as well as the free concession scheme. Part of the card therefore has an ITSO shell within which the concession scheme details reside. From a technical point of view this presents no problem, but from a practical point of view Transport Scotland is not the card owner, and therefore has less direct control around card issuance, card management and the range of reports, checks and balances that give us direct assurance that only the appropriate people are receiving cards and that they are getting them on time.

The Electronic Ticket Machines – The government decided to fully fund a one-off upgrade to the entire Scottish local bus fleet, providing over 7,000 smartcard enabled and ITSO certified ETMs. A framework contract was drawn up and let, resulting in 4 ETM suppliers being identified as capable of meeting the ITSO specification and available to bus operators to select as the provider of their ticketing equipment. In Scotland these suppliers are Almex, ERG, Wayfarer and Thyron (who specialise in small handheld devices, suitable where the vehicle is too small to comfortably accommodate the hardwired bigger units). Transport Scotland are also funding the costs of a number of peripheral items such as back office computers, communications lines, driver training and project management. The all in cost of each unit is around £1-3k depending on supplier. Once the machines are proven to be installed and working the intention is to vest these to the operators themselves.

The Operator Back Office – For larger operators and/or those who run commercial services, PCs are provided to enable the data from the new ETMs to be utilised within the operators' own office systems. Alternatively, small operators who have little interest in the data that the ETM produces have the option of hooking up directly to the Transport Scotland back office or – in several instances – to back offices hosted by the local authority. Where a local authority has a significant subsidised network the attraction of getting comprehensive data on an ongoing basis via the ETMs is considerable, and most rural authorities in Scotland have elected to host a back office on behalf of all or most of their smaller operators.

Transfer of Data – in today's world of broadband and Wireless LAN there are a number of choices available to suit all types of operation and ensure that data can be transferred from ETM to back office on a regular basis from even the most remote locations in Scotland.

The Back Office (AMS/HOPS) – This is the central repository that receives details of every single ITSO electronic transaction and stores and sorts them. It is clearly a key component of an ITSO based smartcard system as, without it, the data from individual ticket machines or operators has nowhere to go in terms of concessionary travel reimbursements. A contract was awarded to LogicaCMG to provide three things – the AMS/HOPS, Transport Scotland's own (non-ITSO) back office system specifically for running a number of reports and automating payments against the concession scheme, and a 7 year managed service relating to the AMS/HOPS. While LogicaCMG did an excellent job in completing the latter component, the AMS/HOPS is still not available and fully functioning. The HOPS is being provided by a sub-contractor to LogicaCMG and it would be inappropriate at this stage to go into further detail here about why this element has not yet been delivered.

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The Future – as well as giving us the means to run the concessionary travel schemes in a way that should minimise fraud by cardholders or drivers/operators, the ITSO smartcard technology also opens up all sorts of opportunities for the use of smartcards across other types of public transport activity and beyond e.g. commercial integrated ticketing, school transport and park & ride, with all the benefits that smartcards should bring about the detail of the transaction.

And Finally A Word of Warning – With the amount of money involved in concessionary fares schemes, they are likely to be an early and ongoing target for auditors. A recent Internal Audit report on the Scottish Concession Scheme identified several potential control issues around the scheme. The report recognised that the risk of fraud reduces as we go smart, and one of the report's recommendations was that we go smart as soon as possible. However, it's also forced us to look at more rigorous ways of controlling the risk of fraud and – although it's not directly related to setting up an ITSO Scheme – there are some pertinent issues to consider.

For more information on the Scottish Scheme please contact Gordon Hanning, Head of Concessionary Travel & Integrated Ticketing, Transport Scotland, Buchanan House, 58 Port Dundas Road, Glasgow, G4 0HF or email gordon.hanning@transportscotland.gsi.gov.uk

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8 USEFUL CONTACTS

8.1 ITSO & ITSO Services Ltd

Call 0121 233 2598

Or visit the ITSO website: www.itso.org.uk

8.2 DEPARTMENT FOR TRANSPORT

Call Ian McConnell 07841 947431 or Nick Rawlings.07841 947383

8.3 EQUIPMENT SUPPLIERS

See ITSO website for current list of certified equipment

8.4 MENTOR AUTHORITIES

The mentors' role will be to provide an additional point of contact for TCAs for queries where hands on experience is required to ensure that the best possible advice is provided.

The mentor authorities are as follows:

Region	Mentor Authority
North East	Nexus (Tyne and Wear PTE)
North West	Cheshire County Council
	Merseytravel (Merseyside PTE)
Yorkshire & Humber	Metro (West Yorkshire PTE)
West Midlands	Centro (West Midlands PTE)
East Midlands	Nottingham UA
	Nottingham County Council
East of England	Watford District Council
	Luton UA
South West	Torbay UA
	South Gloucestershire UA
South East	Wokingham UA

Please contact Ian McConnell (07841 947431) or Nick Rawlings (07841 947383) in the first instance and they will refer your enquiry to a mentor authority where appropriate.

9 GLOSSARY OF TERMS

Term	Abbreviation	Interpretation
Actionlist		Actionlists are sent to ETMs and other POSTs instructing them to perform a specified action on a Pass or other ITSO Product. The action could be, for example, renewal, or addition of value.
Asset Management System	AMS	This ITSO Certified computer system is part of the HOPS, and manages the ITSO Assets within your system. It is the interface to the ISMS.
Blocked card, Blocked Product		A smartcard or a Product stored within a smartcard, which has been electronically marked (within the smartcard) in such a way that it is rejected by POSTs and cannot be used for travel. Blocking usually takes place as an outcome of Hotlisting.
Concessionaire		A person entitled to a concessionary fare
Concessionary Pass		An instrument entitling the holder to travel at concessionary rates.
Customer Media	CM	ITSO term for a smartcard or other device with similar capabilities, such as (for example) a smart watch or a smart enabled mobile phone
Electronic Ticket Machine	ETM	Equipment mounted on a bus for the registering of fares received and for the handling of smartcards
English National Concession	ENC	
English National Concessionary Travel Scheme	ENCTS	
Host Operator Processor System	HOPS	This ITSO Certified computer system that acts as a repository to receive and process the details of every single ITSO electronic transaction (including the onward processing of transaction traffic to other HOPs)

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Term	Abbreviation	Interpretation
Hotlist		Hotlists are sent to ETMs and other POSTs instructing them to block a Pass, i.e. modify its memory contents, so that cannot be used anymore.
ITSO Operating Licence		The operating agreement between ITSO and a Licensed Member. A copy is available on the ITSO web site www.itso.org.uk .
ITSO Operators Identification Number	OID	Identification numbers assigned, by ITSO, to Licensed Members, for operating purposes. They are used to identify participants within the ITSO environment.
ITSO Product		Data stored within an ITSO Shell identifying an entitlement or ticket. The data structure is known as an ITSO Product Entity or IPE. Examples of Products include: identity; concessionary entitlement; tickets; loyalty; and stored value.
ITSO Product Entity	IPE	A data structure, stored in ITSO Shells and used to hold ITSO Products
ITSO Seals		<p>The ITSO system uses cryptographic seals, similar in nature to a digital signature, to verify the integrity of ITSO Shells, ITSO Products and ITSO messages. These seals are computed by the ISAM using complex cryptographic algorithms, and secret keys stored in the ISAM. These secret keys are distributed by the ISMS.</p> <p>Use of the ITSO Seals allows a POST to verify that the ITSO Shell and Products in a presented smartcard are genuine.</p>
ITSO Secure Access Module	ISAM	A security module present in every POST and HOPS. It stores security keys and provides cryptographic processing.

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Term	Abbreviation	Interpretation
ITSO Security Management System	ISMS	The security management service provided by Royal Bank of Scotland as a sub-contractor to ITSO. This service is responsible for providing the security keys necessary for the creation, modification and use of ITSO Shells and Products.
ITSO Shell		A data structure stored in a smartcard or other Customer Media, which acts as an envelope within which ITSO Products may be stored.
ITSO Specifications		Technical Specifications published by ITSO and available on www.itso.org.uk
Licensed Member		A party to the ITSO operating licence. Only Licensed Members are allowed to operate within the ITSO environment.
Pass		Concessionary Pass.
Passback		The situation arising when a card is used for a second time within a predefined short time period. It is intended to prevent a card belonging to somebody on a bus being passed to a person outside the bus and used a second time such that the same card is used for two or more passengers.
Personaliser POST		A POST used to create ITSO shells and Products within smartcards and to print any personalisation details on the surface of the smartcard.
Point Of Sale Terminal	POST	Terminals such as ETMs, ticket office machines and ticket vending machines. POSTs must be certified by ITSO and must contain an ISAM.
Product Embodiment Type	PTYP	An identifier for the specific type of ITSO Product, which is defined by the product owner.
Product Type	TYP	An identifier for the generic type of Product (IPE), which is defined by ITSO.
Travel Concessionary Authority	TCA	The various authorities entitled to (amongst other things) issue passes

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10 ABOUT THE AUTHORS

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Peter Johnson

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This guide is sponsored by Metro (the West Yorkshire Passenger Transport Authority/Executive) as part of its activities as a Beacon Authority for Passenger Transport. Metro is also a member of the Passenger Transport Executive Group (*pteg*).

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11 ADDITIONAL CONTRIBUTIONS

A request to a number of consultancy firms for contributions which give advice and guidance to schemes has elicited the following contributions;

11.1 An anonymous contribution

Going smart gives you an opportunity to improve the accuracy, efficiency and (if you want) timeliness of your reimbursement payments. The transition from previous methods to an ITSO based reimbursement system will take some time. Services based outside your district may go smart a lot later than those you have more influence over. Even when all the services involved have gone smart there will always be a residue of manual claims for such things as journeys made after a pass has been damaged and before it has been replaced.

- "Going smart" gives you the opportunity to reduce fraud and other inaccuracies in the concessionary scheme.
- Passengers' journey information is transferred securely from the smart equipment on the bus to your back office with powerful technical guards against modification or interference.
- The smart on-bus equipment protects against passenger frauds such as pass-back (where the passenger hands his pass back to someone still in line - so one pass carries several passengers). But you still rely on the driver to prevent journeys being given, for example, to friends and relatives using a borrowed concession card.
- As well as replacing surveys as a means of determining reimbursement, the smart system can be extended to provide statistical survey data on all journeys - not just the smart ones.
- Other statistical information going smart will allow you to obtain easily is an analysis of your concessionary costs by home TCA of the passengers.

The point is that you don't get these advantages just by "going smart", you get them by actively coordinating the functionality provided by the various suppliers involved - particularly of the HOPS and POSTs - with the operational practices of the transport operators and of your own reimbursement office and by acquiring the additional back office facilities you need that are not provided by an ITSO HOPS.

So any system used for reimbursement for the ITSO data will have to deal with the pre-smart environment as well. This gives more flexibility to phase in an improved, modern reimbursement system at any suitable time before going smart by using ITSO POSTs.

The "going smart" transition is likely to be complex and prolonged with a low level of activity stretching both before and after the main change. Moreover, because it involves modifying the equipment and operating practices of bus fleets, the initial plan for the roll out to various operators and depots is likely to vary throughout the period. To keep things running and running smoothly needs continuous support and maintenance of the plan and the ability to deploy resource to solve technical, operational and procurement issues as they arise. This is the role that a systems integrator can perform.

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11.2 An Opportunity For Citizen Card Development

Alan Leibert
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Background

In recent years, under the e-Government banner, the ODPM (as was) announced a number of ICT based initiatives, supported by funding, to encourage Local Authorities to develop ICT based services. One of the results was that many Local Authorities either piloted or considered piloting smartcards as access tokens to ICT based citizen services including, for example, library and leisure centre membership, entitlements for services, local shopping incentives and loyalty, social benefit payments and housing services.

However, only a very few schemes continued beyond the pilot phase for a variety of reasons of which the most significant was financial. Either a business case could not be made, or the timescale to recovery was too high, or the initial entry cost was too high. Some Local Authorities attempted to overcome these problems by opting for a low cost entry solution, only to find that it could not be scaled up from the pilot stage. So, while the interest was there, and still remains, especially as smartcards do offer a simple and consistent way to access ICT services – as demonstrated by the widespread use of smartcards by banks and other financial service providers, as well as by TfL in London with its Oyster card – there has been little citizen card activity in recent times by English Local Authorities.

A number of Local Authorities have picked up on the idea that smartcards issued for transport ticketing and entitlement purposes could double as citizen cards. If the transport sector could be persuaded to move to smartcards, then there would be a ready base of smartcards onto which could be added citizen services, with the whole environment offering a strong business case and deployment soon reaching a sustainable critical mass. The problem with this solution was that the transport sector could not make a business case for themselves as first movers and looked to the public sector for support. Again, the result was primarily, inaction.

The Current Opportunity

The ENCTS offers a solution that will allow Local Authorities to develop citizen card schemes at low entry cost; and it is particularly worth noting that there is a high degree of correlation between the client base for the ENCTS and many potential citizen card service clients. It is further worth commenting that other citizens may be supported by smartcards either directly issued by Local Authorities, or with smartcards issued by transport operators as commercial tickets. In either case, we have a win-win solution.

The proposition is that concessionary travel cards issued as part of the ENCTS, and interoperable across the country, may be used by Local Authorities to additionally

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house citizen card applications. Just as the concession card may initially be used as a show-and-go card but is issued ready for electronic use when the infrastructure for such use is in place, so Local Authorities need take no initial citizen card action but may do so as and when ready.

In order to achieve this, there are some necessary provisions that need to be made when the ENCTS cards are issued. Without special action, the card will be locked for exclusive ITSO use and not be directly available for Local Authority use. In addition, all the space on the card may be taken over by ITSO functions. Therefore, action is required at the time cards are formatted and personalised to remedy this potential problem.

LASSeO (the Local Authority Smartcard Standards e-Organisation) has been working on a standard smartcard layout to support Local Authority services in order to relieve Local Authorities of this task, as well as to ensure conformity across Authorities, allowing interoperability where desired. For the Mifare[®] 4K card, which will be the card most commonly adopted by Councils for their ENCTS implementations, LASSeO has defined and published a standard card layout which does not conflict with ITSO card utilisation.

Local Authorities may confirm to their card personalising service (under the DfT approved framework) that they wish to have cards formatted in this way. This will ensure these cards can have citizen card services added as and when they require them, and that the Local Authority has control over managing this part of the cards (through the appropriate keys to access the relevant areas).

Summary

By opting to have the LASSeO citizen card layout encoded onto ENCTS cards when they are formatted and personalised, Local Authorities are building for the future at no added cost by enabling citizen card services to be added under their control as and when desired. A consistent card layout also ensures the possibility for interoperability of citizen card services across Authority borders.

This approach puts control in Local Authority hands to act as and when they are ready and in a manner that best suits their individual environments.

About ALCO Consulting

ALCO Consulting is a strategic consultancy specialising in ICT based services. We have a strong track record in advising Local Authorities on smartcard development, including strategy, business case and implementation planning. ALCO Consulting is also heavily involved with smartcard transport ticketing with close connections to Oyster, ITSO and the development of European standards. For further information contact alan@alco.eu.com

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