

Dream ticket? The challenges and opportunities of delivering smart ticketing in the city regions

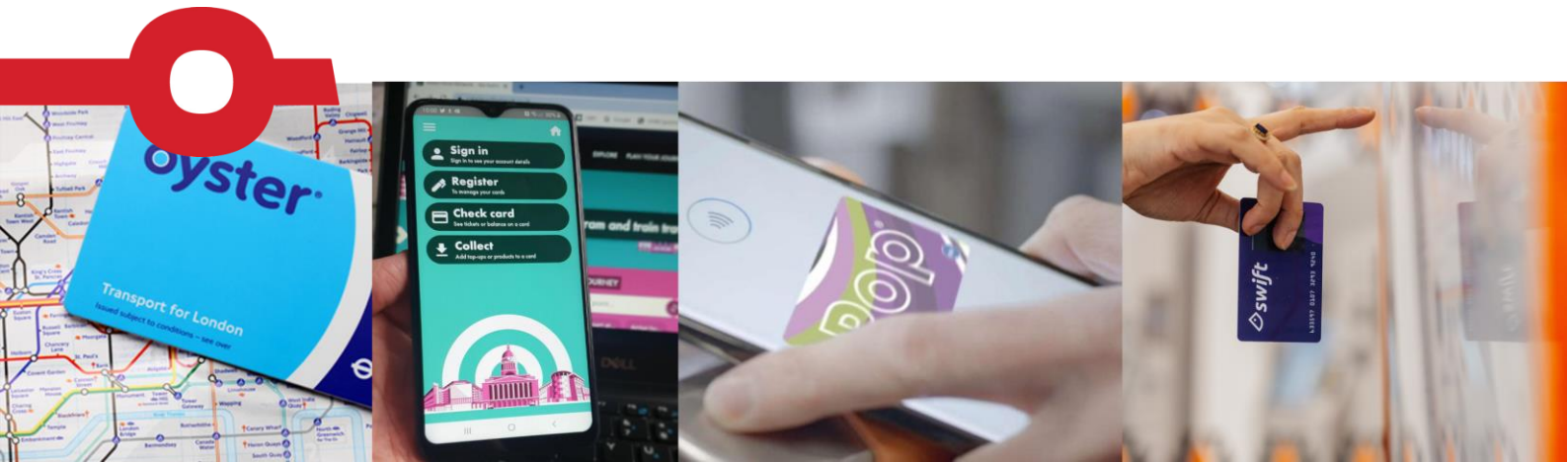


TABLE OF CONTENTS

1.	EXECUTIVE SUMMARY	7
2.	STUDY OBJECTIVES	10
3.	THE ROLE OF SMART TICKETING IN TRANSPORT	12
4.	UTG MEMBERS SMART TICKETING ACHIEVEMENTS	17
5.	STUDY OBJECTIVES – DETAILED RESPONSES	21
6.	ASSESSMENT OF THE TECHNICAL AND OPERATIONAL LANDSCAPE	33
7.	SUMMARY OF RELEVANT POLICIES AND INITIATIVES	42
8.	SMART TICKETING ASPIRATIONS BY UTG MEMBERS	45
9.	SUMMARY OF WIDER LEGISLATIVE AND REGULATORY BARRIERS	49
10.	SMART/INTEGRATED TICKETING AND MAAS	52
	APPENDIX A – DETAILED TECHNOLOGY COMPARISON	54

LIST OF TABLES

Table 1.	High-level Smart Ticketing Technology Comparison	24
Table 2.	UTG Early Collaboration Opportunities	29
Table 3.	UTG Further Collaboration Opportunities	30
Table 4.	Account Based Ticketing	39

GLOSSARY	DESCRIPTION
ABT	Account Based Ticketing. Where ticketing is tied to an account rather than a card. Payments generally taken in arrears. Can be single or multi operator and can include capping. ABT can work across traditional public transport to include additional modes such as parking
AZTEC	The national standard adopted by Rail Delivery Group (RDG) for barcodes on rail
BiBo	Be In/Be Out, a concept normally associated with passive systems that rely on a mobile device or wearable which communicate via Bluetooth
BSIP	Bus Services Improvement Plans. DfT funded initiative to encourage greater bus use in England
CAPS	In an Account Based Ticketing environment where the cost of travel reaches a threshold (day, week etc)
cEMV CONTACTLESS	cEMV and Contactless are terms used interchangeably (or together) for the use and acceptance of credit and debit cards for public transport travel. Can be accepted in a Model 1, Model 2 or Model 3
DENY LIST	Similar to a Hotlist for ITSO a Deny list is a list of contactless cards that is held by the ticketing equipment that the device needs to refuse acceptance
DfT	Department for Transport – key stakeholder for Smart and Integrated ticketing across the UK. Transport powers are devolved though to the Governments of Wales and Scotland
HOPS	Host Operator Processing System - Back Office that each scheme has that processes ITSO transactions – messages. Communicates with ISAMs in ticketing equipment as well as other HOPS
HOTLISTING	The marking of a product or an entire ITSO card to be blocked on its next presentation. This may have been for a number of reasons including a failure to pay or lost card. The hotlist is held by the ticketing device and looks out for a card or product being presented
ISAM	The chip held within Ticket Machines, gates and other equipment reading ITSO smartcards. Holds encryption keys and batches of ITSO data until they have been transferred to the HOPS
ITSO	<p>Integrated Transport Smartcard Organisation. The body responsible on behalf of the UK Government for the maintenance and development of a standard for interoperable smartcard based ticketing</p> <p>The technology that ITSO specifies requires a card or phone with NFC that can interact with ticketing equipment to undertake a journey or make a ticketing</p>

GLOSSARY	DESCRIPTION
ITSO ON MOBILE	The process of virtualising an ITSO card enabling an Android mobile with NFC to contain an ITSO card without the barrier and environmental impact of actually having a plastic ITSO card
LENNON	The system for allocating of revenues between Train Operating Companies that most smart and integrated ticketing systems that have rail as part of them are required to integrate with
MAAS	Mobility as a Service. While many definitions of MaaS exist for most it is the combination of ticketing for traditional public transport modes with additional modes such as e-scooters, with a single payment option. This is combined with other transport requirements such as journey planning and real time information. Can include ITSO, barcode and references to contactless
MODEL 1	Way that contactless cards can be used on public transport – credit or debit card is used to purchase a physical ticket
MODEL 2	Where a contactless card is used as a token allowing travel. Funds are them collected at the end of a charging period. Depending on the configuration the interaction could be Tap On with a flat fare, Tap On with driver intervention or Tap On and Off
MODEL 3	Methodology that allows a particular ticket or season ticket to be held within a Back Office. Ticketing equipment can then access that record to understand whether such a ticket has been pre-bought and is valid for the point and time it is being presented
NFC	Near Field Communications – the technology within Android and iOS mobile phones that allow the phones to communicate with an ITSO card to add products to the card (both Android and iOS) and for Android only to allow the phone to act as a virtual card. For contactless cards held within a phone it is the NFC functionality that communicates with the ticket reader
PART 11	Functionality whereby ITSO transactions typically around retail can be added to a smartcard by a device that does not contain an ISAM. Instead the equipment can access a bank of remote ISAMs. Typically has lower implementation costs compared to traditional equipment that contains an ISAM but the processing speed is normally slower
PASSBACK	Reference within ITSO and potentially other ticketing options to prevent cards from being presented again by a different individual – for example school children passing the card out of the window of a bus to allow its reuse. Passback prevents the card from being accepted again within a prescribed time limit

GLOSSARY	DESCRIPTION
PAYG	Pay As You Go. Can be used in reference to storing a cash balance on a card utilised as travel is undertaken but also a balance held within an account
PRODUCT	Normally used to describe a season ticket purchased within a smart and integrated ticketing environment – for example a four week bus only season ticket valid in a particular area would be known as a product
PVAL	Or Validator- Installed as part of a rail or similar environment where the station’s layout or size does not support a gated solution. Customers may need to Tap in and/or out at a PVAL as part of their journey. PVALs can read any combination of ITSO, contactless and barcode
QR CODE	A type of barcode where the contents of the ticket or product presents as a square of black and white. Within the pattern details of customer as well as their ticket can be encoded. When presented on a mobile phone a QR code can dynamically update during the day to make copying more difficult
RDG	Rail Delivery Group – the key group concerned with national rail ticketing. Holds the standards and systems for rail nationally including a Central Back Office. In time RDG will be consumed within Great British Railways
TOTO	<p>Tap on Tap Off where customers have to present their ABT product or contactless card at the beginning and end of their journey. The Back Office arrives at a fare and any necessary capping for the journey(s) once the full picture is known</p> <p>In the absence of equipment to record the Tap Off the fare can be known if it is constant or if the customer has to state their destination to the driver</p>

1. EXECUTIVE SUMMARY

The current environment within which Smart and Integrated ticketing is delivered and operated across the United Kingdom offers a unique opportunity to progress interoperable solutions that will bring benefits to customers, operators and authorities.

The factors that have led to this situation are wide ranging and include technical challenges, new ways of working, customer expectations, new technological opportunities and a willingness by central Government to invest in the bus industry. There are however a number of key obstacles that must be overcome at a local, regional and national level.

If these opportunities are to be realised it will require Department for Transport (DfT) to provide clarity, direction and consistent support, across both policy and funding, to Urban Transport Group (UTG) members and the wider transport community in order that the desired outcomes can be achieved. By recognising the depth and breadth of expertise that is contained within the organisations making up the membership of UTG, DfT will be able to ensure that developments and innovations are understood, led appropriately and ultimately delivered in an efficient manner.

With effective DfT support, UTG members can continue to innovate, collaborate and present a single voice that demonstrates their ability to create and deliver these solutions on behalf of the entire UK public transport community. However, achieving this requires commitment and changes in approach and attitude.

What are the Key Challenges to be addressed?

Complexity

- There are an increasing number of technical solutions to ticketing, each has its own advantages and disadvantages. Different areas have differing needs and views often leading to deployment of solutions that differ from those of neighbouring areas or may be completely incompatible;
- National operating groups, each with their own ticketing strategies and roadmaps;
- Requirements to meet local and national political strategies, potentially based on poor understanding of the technologies;
- A relatively small pool of skilled individuals within local authorities and operators to define, develop and deliver smart ticketing innovation;
- A small supplier market for core systems, resulting in resource constraints for development and innovation alongside a large number of new entrants offering a range of new technologies which may appear to be the perfect solution but very often cannot support the needs of complex urban transport requirements.

Affordability

- Operators who are unwilling to invest time and resources in multi-operator or multi-modal solutions that they perceive as niche markets or a threat to market share;
- A shift from capital investment for new systems to revenue based approaches (transaction fee based) which are harder to predict and may be unaffordable based on low transaction volumes.

Standards

- Lack of understanding that in a deregulated market, individual operators' systems are designed around their needs and may not be easily joined up to support multi-operator / multi-modal ticketing, irrespective of the ticketing medium;
- Beyond ITSO and rail ticketing there are no national standards for many new ticketing technologies;
- Suppliers seek to lock customers in with proprietary solutions that do not actively enable interfaces with other suppliers;
- Government approaches to public transport separates bus and rail policy within DfT, which does not support the multi-modal ticketing solutions that UTG members require. A much stronger and joined up focus from DfT across modes is required;
- With some suppliers, like Ticketer, now in a dominant market position within the bus industry, there is a risk that without standards, users of other systems are excluded from participation and could lead to less choice and higher costs in the future;
- Although DfT is the core stakeholder in England, the devolved powers in Scotland and Wales allow the development of separate approaches, with resultant issues impacting on cross border ticketing.

The Opportunity

Our discussions with UTG members and the resultant report highlights that, despite the challenges, there is both awareness of these and a willingness to move forward in ways that will maximise the skills held across the members to deliver outcomes that are for the benefit of public transport throughout the United Kingdom.

Achieving this requires more than just words it requires actions and leadership – from across the transport community. These actions must include:

From DfT

- Clear and effective leadership from DfT that ensures that policy and funding is in place for technology innovation that considers bus and rail as one;
- Funding that recognises that investment is not just capital it now requires revenue elements to support 'early years' costs;
- Prioritising funding and investment that supports innovation that is for the whole of the UK not just a region;
- Supporting funding that has demonstrable collaboration between UTG member and regions;
- Ensuring that the skills and knowledge held within UTG and the wider public transport industry to be part of decision making;
- Supporting standards that ensure inter-operability and mandating these where necessary;
- Ensuring that the investment in ITSO as an organisation over many years is part of the solution even if the technologies evolve away from smart cards. This needs to include giving the wider transport community a greater say in how and what ITSO does.

From UTG Members

- Encouraging DfT and politicians to make decisions that are soundly based and capable of delivery;
- Recognition that cities or regions are not islands and that existing and potential passengers do not recognise boundaries;

- Developing strategies and business cases for funding and investment in ticketing technology that will deliver outcomes and benefits across areas that are wider than just a single political entity;
- Supporting collaboration with other members and regions to reduce costs across all aspects of schemes through design, procurement and delivery;
- Greater sharing of skilled expertise, knowledge and experience;
- Recognition that ITS0 has a role to play in the future evolution of ticketing technology and fostering the changes that will require;
- Listening and engaging with other stakeholders, particularly operators, to ensure that they are active participants in scheme development and implementation.

From Transport Operators

- Recognition that inter-operability and integration are important to passengers and politicians and justify investment and support;
- Recognising that the primary aim of investment is to generate *new* passengers not just benefit existing ones;
- Ensuring that ticketing systems and solutions have the capability of being outward looking;
- Ensuring ticketing system suppliers participate in the development of solutions for integrated ticketing;
- Supporting UTG members with resources, expertise and experience.

There is a way forward but none of this can be achieved overnight and there must be changes that demonstrate a willingness and commitment to support the structures and approaches that will allow them to develop fully over time. Evidence of what is possible already exists with the work between Transport for West Midlands (TfWM) and bus operators to develop cEMV, illustrating what is possible with DfT support and investment, but it remains embryonic and addresses only bus with rail having been funded separately. So much work remains to be done, but it is a start.

2. STUDY OBJECTIVES

UTG Requirements

Smart and Integrated ticketing is recognised as one of the key contributors to people travelling more sustainably and boosting public transport usage. Urban Transport Group members have been at the forefront of many of the successful implementations to date. There are a number of factors that point to the fact that there is a once in twenty year opportunity to review the successes and lessons of the past to help shape actions for the next phase of this critical area. This report aims to provide UTG Members with an authoritative, strategic and plain English overview of:

- **The key issues that UTG members need to be aware of in relation to the delivery of smart, simple and integrated ticketing in the city regions.** There are a number of technical and operational issues that have impacted progress in delivery. The report explores those challenges against the background of the significant progress already achieved and plans already in place.
- **The options that UTG members have, given the above, for how best to move forward on the delivery of smart, simple and integrated public transport ticketing.** There isn't a one size fits all solution that can or should be adopted by UTG members. The report seeks to explain and contrast the different options to allow informed choices to be made.
- **The actions that Government and other key players and agencies could take to help UTG members deliver their objectives.** UTG members have a great deal of influence in the development of smart, simple and integrated public transport ticketing. Their local needs have tended to have led them to being the champion for it in their area. In a de-regulated multi-stakeholder environment it is important though that others play their part. The report identifies areas where those other stakeholders can be key enablers in policy, action or support.
- **Any opportunities for collaboration between members in order to deliver individual and collective objectives.** After being at the forefront of so many successful deliveries and achievements in this area, many UTG members have built up a high degree of experience and expertise in the area of smart, simple and integrated public transport ticketing. Sharing that expertise can bring economies of scale and efficiencies. Such working together would have to be balanced against the need for UTG members to deliver against their individual programmes and stakeholder demands.

SYSTRA Introduction and Approach

This report has been prepared by SYSTRA Ltd in response to a tender from UTG seeking a Smart Ticketing Strategic Review. The contents are intended to support senior stakeholders within UTG members to understand the challenges and opportunities around Smart Ticketing in the UK, as well as identifying where the areas where they can bring influence and encourage joint working.

Over the past few months SYSTRA has been gathering the thoughts and aspirations of UTG members around smart ticketing and payment development in the UK. The aim being to create a digestible summary of not only where everyone is on this journey but more importantly of the opportunities and issues that are being created or faced.

During the course of this study we have spoken with:

- Transport for London (Gus Davies & Dale Campbell)
- Transport for Greater Manchester (Helen Humble & Martin Bell)
- Transport for Wales (Huw Morgan)
- Nottingham City Council (Jason Clifford)
- Merseytravel (Gary Evans & Carol Mitchell)
- Transport for the West Midlands (Matt Lewis)
- Nexus (Andy Bairstow)
- South Yorkshire PTE (Richard Crawley & Tim Taylor)
- West Yorkshire PTE (Mike Nolan)
- West of England Combined Authority (Ed Hopkins)

The landscape is complex, different UTG members are in very different places that reflect how ticketing has been developed in recent years with ITSO, the operators with whom they are interacting and the political context. Therefore, their views are a reflection of their position within this landscape. Our work has sought to allow all those with whom we have spoken to express their opinions openly and freely based whether that be based on direct experience or that which they are perceiving. This report does not seek to single out individual views but to distil the collective thoughts of those involved in our research into those views which are widely held and those which exist from particular viewpoints. Where appropriate we have used examples of issues faced but we have not sought to judge whether views and opinions held are right or wrong.

The views obtained via the one to one interviews is supplemented by the authors' own knowledge gained through working directly with and for several UTG members over many years on fares and ticketing projects, work which continues to date.

This report has been prepared following interviews with all of the full members of Urban Transport Group as well as some of the associate members. The interviews followed a structure that had been shared in advance with the interviewees, to allow a level of consistency in responses, but also open enough to allow any significant point to be voiced.

3. THE ROLE OF SMART TICKETING IN TRANSPORT

What do we mean by Smart Ticketing and Payment?

At the heart of this work is the debate around how the public transport industry as a whole delivers a modern and effective fares and payment system to passengers and in which they have the trust that it delivers ‘good value’ and ‘ease of use’. The assumption is that such a system must be ‘smart’ but it does not specify precisely what the technology ought to be, leaving this open to schemes to decide what is the most appropriate approach for their needs.

Most passengers will probably point towards London when asked to describe smart ticketing and payment and they are thinking about Oyster and more recently cEMV payment. However, this does not preclude other technologies and approaches that may be based on products rather than the means of payment which are still smart but approach the problem in a different way. Mobile app-based ticketing does not exist in London but has been very successfully delivered throughout the rest of the country and is well received by users.

A Brief history of Smart Ticketing

Fares and revenue are the lifeblood of public transport and the means by which they are captured are an integral part of the passenger experience. For over 200 years little changed with cash being the means of payment and a paper or card ticket being the evidence of that payment. However over the past 25 years technology has revolutionised both the opportunities for operators and expectations of passengers to an extent where almost anything may be possible.

Smart ticketing has been around in various guises since the mid 1990’s initially led by Hong Kong (Octopus) and recognising the potential of smart cards, PTEG (the forerunner of UTG) in partnership with DfT established ITSO in 1998 to create a standard which stands to this day as an example of how collaboration can deliver an outcome that is still used universally across the UK. In 2003 London launched with Oyster.

Whilst we now perceive of these early schemes as delivering customer convenience and benefits neither came about with this as the primary objective. In London the business case for contactless ticketing was entirely built around the movement and control of passengers through the busiest underground stations where rebuilding would be too costly or physically impossible. Therefore, the programme and business case for new gating and retailing infrastructure not only needed to increase throughput but also contribute towards reducing the overall footprint of equipment to free-up space for passengers to circulate. Oyster card therefore helped reduce dependency on ticket vending machines and allowed gates to handle far more passengers per minute than was possible with magnetic stripe tickets.

Delivering the smart capability in isolation, however, was not enough and the business case required that a high proportion of passengers moved to smart payment. Whilst we now see fare capping as being the benefit delivered, the vital incentive adopted by London was to create a significant fare differential between cash and smart payment. This luxury, only possible in the regulatory environment of London, was the killer benefit that has ensured the success of smart payment in London both in terms of its original objectives but also in how it is perceived by the public.

Even as it was still being deployed based on the TfL issued Oyster Card, it was clear that payments technology was moving towards the contactless use of bank issued cards which offered the

opportunity to reduce the number of cards issued and owned by the scheme as well as the unused credit and deposits held on those cards – in 2019 there were 61m Oyster cards that had not been seen for over 12 months and £400m held for card deposits and unused credit. Thus in 2013, TfL began an initial pilot on bus services to use contactless bank cards and this was expanded to the Underground and rail services in September 2014.

Despite broad consensus that smart payment in London has been successful it is not without its problems:-

- ***A Proprietary Solution*** – Oyster and the subsequent use of cEMV in London is a proprietary solution developed by TfL and Cubic which restricts its expansion beyond that which is within the sphere of TfL interest (which as we will discuss later has become Project Oval). As a proprietary solution it does not allow interfaces with other smart solution such as ITSO and its acquisition or use by other schemes is restricted since open procurement is not possible.
- ***Bus Fares*** – Ensuring the take-up of Oyster required that buses were included from the outset. However, the calculation of stage or zonal based fares would have required exit readers which were considered to be a likely cause of delays at stops. Therefore, the cost of travel across the entire London bus network became a flat fare irrespective of distance. This, whilst popular with the public, resulted in a massive increase in the cost of the London bus network provided by TfL both through reduced fare box revenue but also a need to increase the capacity of the bus network. Whilst this could be balanced by a large revenue surplus on Underground operations pre-Covid this is no longer the case and it is likely that TfL will need to consider both fare increases and reductions in bus service levels.
- ***Discounted Fares*** – the original Oyster card was owned and issued by TfL and allowed discounts to be enabled by the card for children, young people and other eligible groups. This is not currently possible with contactless bank cards and Oyster cards will remain in use to facilitate this. A similar issue exists for free concessions where ITSO capability only exists on the bus network.

However, technology was already moving on and the advent of smart phones created entirely new concepts along with the move by the finance industry to cEMV (contactless payment).

Elsewhere in the UK, operators quickly realised that some of the new ticketing options supported by the introduction of smartphones, such as barcodes, mobile payment and Be-in/Be-out were potentially quick to implement and light on supporting infrastructure. Smart phone tickets initially seen as a backward step due to the lack of data created have quickly emerged as an effective tool liked by both passengers and operators and through which effective relationships with users can be built.

Other technologies are seeking to be the next smart ticket but this is an increasingly crowded space and one in which the chance to show what is possible are equally difficult to find as they too often fail to recognise that they are adding to an already complex ticketing landscape rather than replacing something. It is that challenge of how do we deliver meaningful change that benefits 95% existing and potential new passengers whilst recognising that we need to remember the other 5%.

How Smart and Integrated Ticketing makes Public Transport Attractive

Customers find the de-regulated nature of public transport to be confusing. They do not understand who operates what, what the fares are, and how to achieve the best value. While operators do still

control fares, UTG members have been able via their smart and integrated ticketing programmes to bring elements together.

For customers the use of ITSO or barcodes or contactless can mean that they do not have to worry about knowing fares and carrying exact change.

For transport operators the emergence of smart ticketing has meant that they can have greater confidence that transaction volumes are correct. This has meant that they have been comfortable to join multi operator ticketing schemes that otherwise would have had revenue distribution determined by an estimate.

Electronic reading of ticketing also means that there is less reliance on a bus driver or other front line staff to understand whether a ticket presented is valid at this point at this time. The technology does this for them.

Smart and integrated ticketing has been designed with security and anti-fraud measures from the outset. It is known that there have been many instances of dishonest customers printing their own tickets and the reuse of discarded or sold on paper day tickets is endemic.

Using clever design, smart and integrated ticketing includes features that can ensure that customers can only obtain the fare that they are entitled to. For example it is possible that a child can prove their eligibility for a reduced fare concession via a one-off setup. The encoding of the card or electronic product can then automatically offer half price fares when presented to a bus ticket machine or other retail systems can be set to read that electronic authority before retailing a child priced season ticket. Without smart ticketing the judgement as to who is eligible for that child concession would fall to the front line staff whether that be a bus driver, gate operator or retailer.

For an authority or an operator the data provided by smart ticketing can be used to understand journey trends and for new ticketing options and wider planning to take account of journeys actually being recorded. For example it is now possible to know how many journeys a four week season ticket holder actually undertakes – on which service and at what times. If the customer is registered then it is possible to map that by another characteristic such as gender or postcode. For example, in the early days of lockdown it was possible to see whether the message that travel should be curtailed had been heard by concessionary card travellers. That meant that reinforcement of that message could be targeted at the areas where the contact was most important.

Individual operators understand that multi-operator and multi-modal ticketing can increase public transport usage but can be focussed on their own short term journey numbers. The work from UTG members on integrated ticketing removes one of the barriers against them taking part in a multi operator and potentially multi-modal ticketing scheme as many of the challenges are resolved for them.

Car and car ownership can be seen as being affordable. Once purchased they are definitely seen as easy to access – simply turn the key and go. In other areas of commerce, purchasing has become very straight forward. Many people now use credit and debit cards via the contactless interface continuously. While travelling in a multi-tenanted environment is different from traditional shopping – no one would expect a high street retailer to have knowledge of a customer's contactless card transactions at another shop – but public transport users are increasingly looking for their retail experience on a bus or tram to match that being offered elsewhere, particularly that of London. This can only be achieved with smart and integrated ticketing.

The provision of smart and integrated ticketing can be tied to the preparation of MaaS apps where smart ticketing can be fulfilled directly to within the MaaS app and can be offered as part of a wider public transport offering including information and journey planning.

Embedding ticketing into the customer's existing mobile telephone can reduce costs and wastage in regard to paper tickets or plastic smartcards.

What is the opportunity now?

There have been many notable achievements in the field of smart and integrated tickets over a number of years. Many of these are as a result of the efforts and ideas of UTG members. However, developments have been limited, to a certain extent, by the need to operate regionally rather than with a clear national structure. There remains a plethora of ticketing technologies that are in use. This has resulted on a fragmented offer when viewed at a national level.

As private companies, bus and rail operators have had much greater freedom to manoeuvre and deliver quick wins through innovation whilst facing up to the edge cases once the core concept is in place. At the same time they could implement across businesses that cover large parts of the UK giving economies of scale. However, as the public sector plays a greater role in investing in innovation the justification of schemes requires business cases that cannot be found at a 'local' level and evidence at the outset that the edge cases will not be 'disadvantaged'.

The challenge is therefore to recognise that innovation is not usually about our existing users, for whom existing methods of ticketing will remain, it is about attracting new users who do not currently consider public transport an effective or viable alternative to the car.

It is into this landscape that UTG members are seeking to innovate and develop fares and ticketing. Some areas have been more adept at delivering innovative schemes either through a willingness to invest and take risk or through strong operator relationships, but the solutions created remain local and far from easy to scale up beyond the specific region. It is in this area that the greatest opportunities for UTG lie.

The rail industry has demonstrated that through co-ordinated development inter-operability is achievable and whilst people perceive buses to be 'local' there will always be an edge, the places where people do not all head in the same direction and where bus services link communities that may be separated by an invisible administrative line but in all other respects are one place. A ticketing scheme designed and implemented by one administration is unlikely to be well received if it disadvantages its neighbour. Will the bus require two ticket machines? Who will use which one when? Nor is it likely to further the cause of improved bus and rail integration if there are a multiplicity of approaches to barcodes or cEMV acceptance.

Neither bus operators nor passengers will thank us if these issues became a reality but it is a distinct possibility if schemes fail to adopt an approach that is consistently outward looking and collaborative.

This is not to say that many UTG members are not already seeking to do this, TfWM and the major bus operators have created a common project for cEMV capping. TfW is actively working on approaches to integration of fares and timetabling for bus services that serve areas well beyond the rail network and is sharing those lessons more widely. The detailed sharing of knowledge between schemes takes place but tends to be informal and based on individuals rather than a clear structure where information is disseminated or made available for when it is needed. It would also help to avoid duplicated effort and wasted resources with the opportunity to share work and effort based on clear and shared goals that will benefit the whole industry.

No-one can accurately predict the "new normal" following the pandemic. There remain significant concerns over future passenger journey numbers with strong leisure recovery but a continuing lag in commuting and concessionary travel. Nor are these equal by areas, passenger type or mode.

Against the challenges there are opportunities around a government recognition that public transport is important to the wider economy, these include:

- BSIP funding awards;
- Programmes to look at ticketing nationally such as around contactless capping;
- A renewed wish that rail should be more closely integrated with bus and other modes;
- MaaS solutions are being piloted in several areas with more coming on stream shortly.

Several UTG members are actively pursuing franchising as a core tool to provide improved bus services including smart and integrated ticketing.

Fifteen years ago many UTG members were critical to the development of ITSO, working together to help shape this essential technology leading to a solution where tens of millions of card holders have undertaken billions of smart journeys.

The current challenges and opportunities point to a conclusion that UTG members are at a critical point in their smart and integrated ticketing development path. Working individually will continue to bring benefits but perhaps not at the scale and completeness that circumstances and business cases demand.

There is consensus on what is needed next and indications are that now is the next watershed moment where the necessary outcomes can only be achieved by UTG members working together - both to deliver outcomes and to influence others as to what part they must play.

Only then will it be possible to take advantage of this, once in a generation, opportunity to reset the options around smart and integrated ticketing.

4. UTG MEMBERS SMART TICKETING ACHIEVEMENTS

It is always appropriate to examine and challenge what could be improved or done differently and this is the case in regard to the UTG deliveries of smart and integrated ticketing. It is also important to recognise the achievements that have already been made. Many of the most innovative and successful developments and deliveries of smart ticketing to date have been as a result of work by UTG members. While there isn't space to list them all here it does help set the scene of what has been achieved so far.

The achievements are grouped by the technology area with examples of where UTG members have had successes within those areas.

ITSO

The success of ITSO is entirely attributable to the commitment and drive of UTG members over many years.

UTG members (as PTEG) recognised that without intervention the development of smart ticketing would have been fragmented and were instrumental, in partnership with DfT and bus operators, in the setting up of ITSO as the interoperable standard. This also reduced the opportunity for there to be one monopoly supplier to the industry. Members of UTG staff were seconded to setup and develop ITSO and they were initially based in what was then Centro's office in Birmingham. Without a perceived business case from transport operators some UTG members gifted or leased ticket machines and ISAMs to operators. Other investments were made by UTG members including money spent on rail gates and ITSO retailing. It was this that allowed English National Concessions for the elderly and eligible disabled to be available from 2008. In the years that have followed those original ticket machines have been replaced but remain the platform for concessionary and commercial smartcard schemes of which some of the largest are operated by UTG members.

ITSO's published figures show that there are 16.5 million ITSO cards in circulation completing more than 2 billion journeys with almost half of them being commercial smartcards. A large percentage of ITSO's volume can be attributed to UTG members.

In the West Midlands, Transport for West Midlands' Swift card has been in place since 2012 and alongside ITSO concessionary cards accounted for nearly 1 in 3 journeys on public transport in the region. Swift is valid on bus, tram and train and has an offering for all customer classes including children and students.

While the West Midlands' PAYG solution was designed so that customers could buy a ticket, both Nottingham and Nexus (Metro) included complex capping into their solution so that the amount a customer spent during the day was capped directly by the card. For bus the Nexus PAYG was designed to allow the purchase of a ticket.

ITSO on other Modes

Merseytravel, Nexus and Scotland are amongst the UTG members to have extended ITSO smart ticketing to ferries.

Many UTG members have extensive rail based ITSO schemes that operate within a gated environment or with PVALs.

ITSO and Reduced Fare Travel

Many areas support free or reduced fares for children. To remove the burden from drivers and other front line staff ITSO cards can be issued once proof of eligibility has been provided.

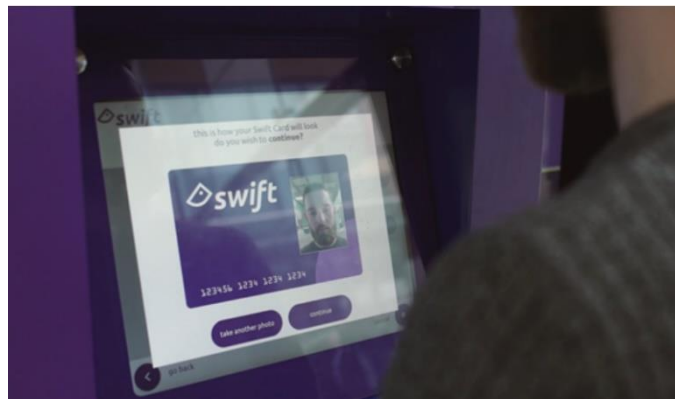
These cards can be encoded so that retail points can recognise them as child cards and retail discounted price products or used on a ticket machine to enable child fares to be purchased.

Following their successful ITSO based smartcard for COP26, Scotland has recently launched free bus travel for all under 22s on an ITSO smartcard.

ITSO Retailing

Most UTG members have apps that allow the purchase of products and PAYG top-ups online to be added to smart cards reducing the need for customers to visit a retail point

Merseytravel, TfGM and Translink have contracts in place for the retail of smart ticketing with Paypoint while Nexus, South and West Yorkshire together with TfWM have a similar arrangement with Payzone. This opens up thousands of local outlets to retail smart ticketing. Many of the customers accessing smart ticketing via these retail outlets use cash to buy their smart ticket.



Operators in the West Midlands insist photographs are included for smartcard cards with season tickets or Account Based Ticketing and TfWM have installed Vending Machines that are able to take a photograph and print a Swift card with that photo on, encoded with the product purchased.

ITSO on Mobile

Nexus have now successfully launched PAYG with capping on the Metro using ITSO on mobile technology via a virtual POP card.



TfWM have season tickets available on tram via ITSO on Mobile and have proved their functionality on rail and bus. Nottingham have proven technically their ITSO on Mobile solution – PAYG with capping – supplied by Rambus and are looking to a launch of their virtual Robin Hood Card.

ITSO Account Based Ticketing

TfWM, via Swift have progressed beyond a full range of traditional pre-purchased travel products to Account Based Ticketing. Capping is available across bus and tram for day, three day and weekly periods. The concepts designed in the West Midlands are now being looked at widely by other UTG members to see how they can be used to evolve their own ticketing and resolve issues around customer flexibility and reporting.



cEMV Contactless

London has the largest and most comprehensive and integrated smart ticketing network in the UK with both cEMV contactless and Oyster card acceptance readily liked and understood by so many. Contactless card acceptance on the TfL network contributed to its widespread acceptance in all parts of the UK retail network. It is this London offering that is sought by other areas.

Nottingham has previously been at the forefront of ticketing initiatives with their multi-operator and multi modal contactless scheme offering capping across zones with the innovative Robin Hood scheme which used ITSO. Recently capping across zones for most buses and trams in Nottingham using cEMV has been implemented. Technical constraints have prevented this from being extended to all bus operators.



In Greater Manchester the milestone of 10 million contactless journeys on Metrolink was recently achieved. The offering includes daily and weekly capping.

TfWM, working with Nottingham and others in the East Midlands via Midlands Connect and with Project Coral, have successfully developed the contactless broker solution to the point where delivery requirements are understood. It is intended that this will provide the missing link where contactless cEMV solutions from different vendors are able to be combined offering capped travel across operators and modes.

Barcodes

Many of the barcoded ticketing options have been provided as operator own solutions. These have taken advantage of the technology being offered by ticket machine manufacturers such as Ticketer and, as they were not intended to be interoperable, only needed to meet the needs of that operator.

South Yorkshire and West Yorkshire have benefited from the use of their own technology company – Yorcard – that has provided the services underpinning their successful smartcard and more recently barcode offerings. Their MCard solution has been adopted exclusively for under nineteen concessionary travel.



Wider use of barcodes across integrated transport will require Stagecoach to have completed their rollout of readers across their bus fleet.

Rail has shown that it is possible to have a national barcoded solution.

Proprietary Technology

Northern Ireland was not required to adhere to the ITSO standard and instead Translink implemented a proprietary solution within the Flowbird equipment and Back Office. Given Translink’s position of running buses and trains this has enabled them to provide a full range of integrated ticketing options.

Bus/Rail Fares and Ticketing Integration

Transport for Wales have taken advantage of the absorption of TfW Rail to develop full bus and rail ticketing integration between their long distance TrawsCymru network, which serves many communities that no longer have a rail service, and the national rail network. New virtual stations have allowed through rail ticketing, new journey opportunities and even reduced prices, all of which are accessible through national rail retail systems. Initially undertaken as a pilot, the scheme will be rolled out across Wales over the next few years and it is attracting interest from both other authorities and rail operators as a template of how to achieve meaningful and sustainable integration.

MaaS

Mobility as a Service is not a technology per se but does utilise one or many smart and integrated ticketing solutions.

A number of UTG members are in the process of introducing MaaS solutions and either at the procurement or development phase. Scotland is undertaking several MaaS pilots from which valuable lessons are being learned and fed back into this vital area. The TfWM Swift App provides the ability to locate a Beryl bike then, once the ride is complete, to pay for it using the customers payment methods within the Swift account.

This is likely to be a growth area in the future as more MaaS apps come to market or are developed by schemes.

5. STUDY OBJECTIVES – DETAILED RESPONSES

Requirement

“The Key Issues facing UTG members delivering Smart Ticketing”

Despite many attempts to simplify it, smart and integrated ticketing across a combination of geography, modes, aspirations and suppliers will always be complex. While many of the issues facing UTG members relate to the technology, it needs to be recognised that there are other elements that need to be considered.

Engagement and being realistic as to what is attainable by when are just as important.

New technology - there is no equivalent of ITSO for standards and inter-operability in respect of barcodes with regard to their acceptance, use, blocking and reporting.

Unreasonable deadlines and asks can lead to a solution that is incomplete or lacks the underlying stability that is needed.

However good the Smart Ticketing offer is, take-up will be less than hoped for if there is not a strong provision of public transport services.

Complexity

One size rarely fits all and that is the case within Public Transport. There are different technical approaches available to support ticketing. Each of these have their advantages and disadvantages that can vary depending on the geography, presence of heavy and light rail, which operators provide services, proximity to other metropolitan areas etc. There is a requirement to choose one or many technical ticketing options and ensure that there are sound logical arguments to support that choice. This is all against a background of a demand for a particular technology from local leaders because for example, *“Manchester or London has it”*.

UK smart ticketing is a complex area and there is a relatively small pool of individuals with the relevant skills and experience to fully understand it from both a technology and public transport operations perspective. This leads to a lack of skilled resource being available to define, develop and monitor project delivery. Expertise within UTG members is higher than within most other local authority areas but responsibility for leading on smart ticketing can sometimes fall to an individual or team with a much wider remit. At times, when there are other issues at play, this can reduce the focus on smart ticketing development.

While there are a core number of technologies and core suppliers there is also a constant stream of companies and individuals that promise that they have developed an idea, system or piece of hardware that will resolve all of the challenges of public transport in one go. Evidence to date says that there is no such magic bullet, but some of the ideas show merit and can usefully contribute either in the short or longer term to the outcomes that are being sought by UTG members. However, all too often, it is often the case that these companies manage to find the ear of local politicians and senior leaders and can dazzle them with demonstrations and capabilities that are illusory. One of the core challenges is to identify those concepts that might work in the complex multi-operator, multi-modal environment that UK public transport is. It is equally sometimes necessary to be ready to explain to politicians and senior leaders why the solution that they saw at a conference might not be quite as simple to introduce or deliver the outcomes desired as they thought.

Affordability

In the main, UTG members do not take revenue risk and are currently not decision makers in the area of operator own tickets that make up the vast bulk of tickets purchase. The majority of operators see multi-operator and multi-modal as being a niche part of their business and are reluctant to invest time and effort into something where volumes and revenue may not be high. However it is worth noting that the TAS Partnership National Bus Fares Survey (2019) found that 77% of all sample journeys in the survey had a multi-operator alternative, although this varied between, markets and region⁽¹⁾.

Solutions have to be affordable especially in their operational phases and as ticketing solutions get more complex it is more likely that there will be multiple actors who will all be looking to receive a fee for services. Even if that fee is very modest, then a combination of charges could make a transaction type unaffordable against a low value purchase such as a single bus ticket. Individual UTG members may have a challenge negotiating these fees down especially when volume cannot be promised.

Standards

Customers have been using contactless payments for many years in traditional retail – much more so since the pandemic. Many will have travelled to London and experienced how easy it is to tap in and out. Consequently they simply do not understand why this is a challenge in public transport. Single operator and even local multi-operator contactless capping using the equipment from single and related suppliers is relatively straight forward but the full contactless solution across estates requires a more joined up national approach.

While there has been an increase in the barcoded ticketing offer, many have been constrained to particular operators, areas or ticket machine/gate suppliers. Outside of rail, there is no national standard for barcoding in the same way as there is for ITSO and likely to be for contactless. This can lead to complications, delays, additional costs and a poor customer offer.

There is still a propensity for modal groups to wish to concentrate on their own modes. This is understandable especially when faced with the implementation of solutions that are very complex even within a single mode. While all say that they understand the importance of joined up multi-modal thinking there remains projects and programmes focussed on one mode. Rail is a particular issue given that it operates to a national model, with national systems. This failure to address multi-modal radiates downwards from DfT, which separates bus and rail policy, in a way that no UTG members do when considering ticketing strategies.

Some areas are served entirely/predominately by bus operators that use Ticketer ticketing machines with a supporting contactless back office from Littlepay. This has led to integrated solutions being based upon that technology. However, that it turns risks exclusion for an operator not using Ticketer and that Ticketer becomes a near monopoly provider which could lead to less choice and higher costs in future ticket machine purchases.

The major bus operators operate nationally and therefore have the advantage of being able to quote national 'systems' policy when they do not wish to fully participate in an initiative or equally a local view when that suits their objectives more. The advent of Project Coral has strengthened this position of speaking with one voice against local initiatives which do not suit their wider agendas. Outside of northern England the disparate nature, politically and geographically, of UTG members results in them presenting a much more localised area view, rather than a uniform one.

¹<https://www.gov.uk/government/consultations/public-transport-ticketing-scheme-block-exemption-call-for-evidence/public-transport-ticketing-scheme-block-exemption-call-for-evidence#general>

Although DfT is a core stakeholder in public transport in England, the devolved governments of Scotland and Wales have different structures, aspirations and powers. In the same way that customers do not understand the boundary between regions, they want the same experience and ticketing offer for a journey entirely within England as a journey of a similar distance passing between England and Scotland or England and Wales. Bus and rail operators mostly operate in more than one country and their offer doesn't vary at the boundary points.

Requirement

“What options do UTG members have to move forward with Smart Ticketing?”

There is no one ticketing solution. Outside of London there isn't a monopoly of equipment and the ability to set fares alongside choosing ticketing technology. As such, none of the progress that has been completed by UTG members to date can be criticised as achievements were made against the backdrop of circumstances in that region at that time.

It is the case though that regions stand at a crossroads where decisions they make now could have a significant impact on their own and others' fares and smart ticketing plans.

There are a number of core ticketing technologies that can be utilised when offering smart and integrated ticketing. Table 1 below compares and contrasts the functionalities and capabilities of each technology.

The choice of technology has an impact on how effectively a UTG member can work alone. Working with rail brings additional challenges for UTG members. While there will be local pressures to work with rail within a region's area, there is a risk that this could delay or undo the wider work being completed to integrate rail in England with other modes. If such a solution is possible locally then it could mean that a national solution is more complex and perhaps never gets off the ground.

ITSO

UTG members may continue to develop their own ITSO schemes – concessionary and commercial. Whilst there would undoubtedly be benefits in collaboration, an ITSO scheme's design, configuration and operation can be set by an individual UTG member working with the operators in their area.

Barcode

A barcoded smart and integrated solution could be created and operated by a single UTG member, working with operators, in a similar manner. However there remain challenges between system suppliers and the nature and requirements of the actual barcodes in the absence of national standards.

cEMV Contactless

A multi-operator and or multi-modal scheme could be completed locally if there was the same ticketing equipment in place. Nottingham Contactless is an example of this – though it also reflects the challenge of including all operators. Moving outside of this arena to other modes and other ticketing suppliers is likely to be a challenge. Developing such a system was explicitly forbidden from being included in a BSIP application presumably at the time because the view was that this would be completed once for

the whole of England by Project Coral and/or TfWM. A successful local integration might be possible but then might make the implementation of the Broker more difficult to justify or to achieve.

Table 1. High-level Smart Ticketing Technology Comparison²

	ITSO	BARCODE	cEMV / CONTACTLESS
National Standards and inter-operability	The ITSO standard controls inter-operability and the transfer of information between schemes and operators	Rail produce barcodes to their national standard and process them centrally. Elsewhere the provision of barcodes is scheme or equipment supplier specific	The acceptance of cEMV cards by an operator or a scheme is governed by very specific rules. There is currently no national standard for working across operators or a scheme.
Form factor (Does it need a card?)	Where ITSO products are provided via a smartcard then the customer must hold a physical card. There are opportunities for ITSO products to be enabled as a virtual card. <i>Currently only on Android phones only</i>	Barcodes can be provided on a paper ticket or embedded into a mobile phone app. Some barcodes can also be added to the Google Pay wallet	For cEMV contactless customers can use an existing credit or debit card if they have one. cEMV Contactless can also be accessed when a card has been virtualised into a mobile phone and on wearables such as a watch.
Equipment/Infrastructure requirements (How is entry/exit validated)	For ITSO a ticket machine or gate would need to contain an ISAM and would have to be ITSO certified. All buses in England, Scotland and Wales must currently read ITSO cards in order to meet the requirements of the concessionary schemes	To read a barcode the ticket machine or rail gate must contain an optical reader in order to read and translate the barcode contents	For cEMV contactless cards the readers must be equipped with a certified reader.
Types of product	ITSO products can hold time based single journey and period based season tickets, a PAYG balance stored on the card to purchase tickets and act as a token to a PAYG balance in the Back Office	Barcodes can be used for tickets for individual journeys, day and longer period season tickets and as a token for Account Based Ticketing. Since a barcode cannot be dynamically updated it	Depending on the configuration of the ticketing equipment cEMV contactless cards can either be used to purchase a ticket ("Model 1") or to be used as token to be

² A more detailed description of the Ticketing Technologies is included in APPENDIX A – Detailed Technology comparison on page 54

	ITSO	BARCODE	cEMV / CONTACTLESS
		cannot be used for a PAYG balance	charged in arrears (“Model 2”). It is also possible to hold a specific product in a Back Office against that cEMV contactless card details (“Model 3”).
Registration	ITSO cards need not be registered unless it is a scheme rule	There is no requirement for registration for a barcoded but individual schemes/products may require that	For the purchase of paper tickets or in use in a Tap On and Off environment registration is not required. Where the product is held in the Back Office then registration would likely to be required.
Restrictions of acceptance	An ITSO product can be restricted so that it is not accepted outside of a specific area or timeframe – for example after 09:30	Barcodes can also contain information as to their acceptance criteria that can apply upon their presentation	There is no opportunity to limit the acceptance of the a cEMV contactless card.
Security	ITSO is considered to be highly secure with built in encryption via a chip in the card and its interaction with the ISAM in the ticketing equipment	Barcodes can either be delivered via an app which can have built in security features. Where a barcode is presented on paper then it is less secure and more prone to copying.	cEMV contactless card security is very strong with high levels of encryption.
Concessions for the elderly and eligible disabled	In England it is mandated that cards are ITSO cards produced to a standard design and specification. This is also the case in Scotland and Wales	Not available on barcode	Not currently available on cEMV contactless cards.
Children and other	Many schemes use ITSO cards, often with a photograph, as proof of eligibility of a concession for children	Children and other concessionary tickets and products can be made available on barcode	For a child concession to be available on a cEMV contactless card it would be necessary for a system to understand that it was held by a child. cEMV contactless cards are not normally issued to children.

	ITSO	BARCODE	cEMV / CONTACTLESS
Retail Options	ITSO retail devices need to have either an ISAM included within the retail equipment to sell products and top-up PAYG or have access to a remote bank of ISAMs via a Part 11 solution. Either way there are only a small number of ITSO certified suppliers.	There are no restrictions as to how barcodes are retailed except for those that are contained within the individual scheme rules	cEMV contactless cards tend to have at their heart a funding source that is debited either immediately when travel is undertaken or at the end of the day if capping is taking place. Existing prepaid cEMV contactless card providers have mechanisms for adding balance to the card via ATMs or similar (ie PayZone).

Requirement

“What actions could Government and others take to help UTG members?”

UTG members collectively represent more than 20 million residents but too often operate as islands.

Improved collaboration will enable boundary issues and business case development to be looked at more holistically. Other key players are critical to the success of the design, development and operation of smart and integrated ticketing.

In England DfT are key to that consideration, *integrated* thinking and policy making needs to begin at the top. This will ensure that organisations such as those leading developments in rail and bus can be guided and funded accordingly.

DfT, Transport Scotland, Transport for Wales, CPT and GBR/RDG need to back and support UTG members’ intentions to introduce a consistent multi operator and multi modal barcoded ticketing approach that covers the whole of the United Kingdom.

Funding

Government funding awards are very welcome but can be inconsistent in their timing as well as their overall linkage to previous awards. Awards can sometimes appear to be intended to set one region against another rather than working towards a single common goal. More consistency and certainty around funding awards would make forward planning easier.

Capital and Revenue

While many regions understand that revenue costs must ultimately be picked up by the operator or scheme, a restriction preventing money being spent on revenue items can stifle the opportunity to seed fund an initiative while it gets off the ground.

Supporting UTG as the Subject Matter Experts

UTG members have built up significant expertise in the complex areas that makeup smart and integrated ticketing. Efficiencies could be achieved if issues were tackled once, and funded once, utilising the very best of those subject matter experts.

Modal Equality

DfT seems to have a closer and more strategic affinity with rail than it does with bus in particular. A clear policy and set of intentions in respect of bus would assist UTG members in their development of smart and integrated ticketing. This is especially relevant in the areas of the expansion of PAYG via Project Oval as well as the investment in PAYG for Rail slated for the Midlands and the North.

ITSO

DfT is still seen as the owner and operator of ITSO. While neither of these are the case now there is a link in ITSO operating under a licence from DfT and the specification falling under Crown Copyright. UTG members would benefit from clarification as to where DfT fits in with ITSO and what can be expected from them in that regard. Without that DfT lead, licensed members and suppliers can feel that they do not have a proper voice in ITSO’s plans and operation. DfT could also exert pressure on ITSO to ensure that the appointment of Board Directors was transparent and representative.

Innovation

DfT needs to continue its support for ITS0 innovation and support one or more pilots to allow the trialling of ENCTS cards on mobile devices. This would support the wish by UTG members and passengers to be more sustainable and reduce the costs of plastic cards.

Clear Strategies and Policies

A clear unequivocal statement on policy and process, from DfT, in regard of the Project Coral/TfWM Broker and how it delivers inter-operability would help steer UTG members into understanding how much effort would be appropriate for their own multi-operator cEMV contactless solutions.

Rail Engagement

RDG, Great British Railways and others have ambitious and exciting plans for the simplification of smart and integrated ticketing for rail. While understanding the size and complexity of that programme of works, it would assist UTG members if bus, tram and other modes could be incorporated into that rail work from inception.

Requirement

“Opportunities for collaboration between members”

There are numerous examples of where collaboration between UTG members can bring opportunities and advantages. However, it will need to be recognised that collaboration is a two way street and needs time invested and support given to others as well as benefits being received. It would be impossible to guarantee that the support would be received and given in exactly equal amounts.

Seeking collaboration within the current operational envelope can and will bring benefits. The highest number of benefits though of collaboration would be achieved by thinking bigger. If different authorities sought to take the lead in different areas – effectively becoming Centres of Excellence – then consistent approaches would be possible.

There is an opportunity for UTG to take the lead in developing a single approach for single and multi-modal public transport barcoded tickets.

UTG could also collaborate on solutions for the unbanked and those without access to mobile phone technologies that provide high quality customer offerings but with an affordable cost of sales.

UTG is not an island and it is not suggested that collaboration between UTG members is all that is needed to develop, enhance and operate smart and integrated solutions. As is noted elsewhere within this report, there are other absolutely key stakeholders including major transport operators. The assertion is that UTG working together with these other stakeholders would be the best combination of resources and skills that could be applied. The model of joint working between TfWM and Project Coral could act as a blueprint for joint working in future.

Some of the collaboration activities could be undertaken without significant expense and could see immediate benefits including cost savings. Over time these elements could be expanded upon.

Table 2. UTG Early Collaboration Opportunities

SUMMARY	DETAIL
<p>Input to ITSO’s decision-making function to ensure that UTG members’ interests are at its forefront</p>	<p>ITSO remains at the heart of smart ticketing in England, Scotland and Wales both in a commercial sense but also in regard to concessions. As a membership organisation ITSO is heavily influenced by the vocal few. ITSO moved away from its previous structure where there were Non Exec Directors to represent the Public Sector. Decisions made by ITSO, for example in regard to the proposed new specification, will impact UTG members both at a capital and revenue cost level.</p> <p>Work to meet a new specification version will divert suppliers in the market place from delivering more innovative solutions. There is an opportunity for a joined up view for UTG to be presented to ITSO to ensure that any changes are understood and to be of benefit.</p>
<p>ITSO ENCTs pass validity extension</p>	<p>A simple change that would potentially save significant amounts of money is extending the validity of new ENCTs passes for the elderly from the existing five years. UTG could come together to lobby for that to be permitted.</p> <p>Wales already issues concessionary passes for up to 10 years.</p>
<p>ITSO ENCTs pass via ITSO on mobile</p>	<p>From the interviews a number of areas were keen to explore how the ENCTs pass could be incorporated into the ITSO on Mobile functionality of Google Pay. This would save card issuance costs and meet a customer demand. UTG could run this as a combined project pooling resources and sharing results with other members.</p>
<p>Work with Apple and other wallet providers</p>	<p>Being able to provide ticket on a card emulated within a mobile phone is widely seen as being attractive for scheme operators as it saves on the costs of cards and many customers want and even expect it as it saves them the effort of obtaining and storing a card. Many customers report wishing to use their phones to support all parts of their lives including travel.</p> <p>The fact that the current provision is not available on Apple devices limits this solution’s attractiveness and complicates the customer offering. UTG members could take the lead with Apple and other wallet providers to push for a solution that is consistent and available as soon as practical.</p>
<p>UTG members using the systems of others where procurement rules allow</p>	<p>There is an opportunity for UTG members to use systems already in use by other members. This could be delivered entirely with local branding as customers would not see how the back office engine was provided.</p> <p>Inter-operability such as this is core to the structure of ITSO for example and is the basis on which TfWM’s Swift PAYG was provided to buses in Hereford. This also reduces the numbers of systems in use that inevitably need to be combined in order to deliver wide spread integrated ticketing to customers.</p>
<p>Reducing procurement effort by utilising existing framework contracts</p>	<p>Many of the UTG procurements were set up as frameworks but there is a not a clear understanding amongst members of what frameworks are available for what. Sharing these details more widely together with</p>

SUMMARY	DETAIL
	<p>the route necessary to access them could lead to there not being a need for a formal procurement at all.</p>
<p>Sharing results from customer research reducing duplication and allowing a broader spread of research to be available to others</p>	<p>Each scheme and region undertakes their own customer research yet there are bound to be similarities between customer requirements across areas. A combined approach could lead to a bank of customer research being available. Depending on circumstances it would unlikely to offer a complete picture. For example an authority might have a particular interest in the views of students. The answer bank would enable them to target their research around that particular customer group – and they would then add the results to the answer bank.</p>
<p>Working together to share best practice for Data Analysis and Fraud Prevention including sharing the results of that analysis</p>	<p>Within this report the importance of data analysis in general and also relating particularly to fraud is detailed in a later section. There are differing levels of capability and capacity in regard to data analysis. This is another area where UTG could work together providing either assistance or examples of what data analysis techniques are used and what results have been achieved.</p> <p>Looking at the bigger picture there are opportunities for a Centre of Excellence in this regard as well providing data analysis for other UTG members. In regard of fraud it would help if there was a consistent view of what actually entails fraud which UTG members could agree on. For example is it acceptable for an elderly concessionary card holder who moves within England to carry on using that card until it expires or must it be replaced with one from their local scheme immediately. Such agreements would provide a more consistent approach to customers and could also save considerable expense from being incurred.</p>
<p>Working together on a common approach to the NFI</p>	<p>During the interviews a number of UTG members raised the point that it would be beneficial if UTG had a common approach to working with the National Fraud Initiative. This is an example of something that everyone has to comply with and there was a wish to be as efficient and consistent as possible. UTG could put in place a small project to provide guidance in this regard.</p>

Other collaboration activities are more involved and will likely to take longer. Working together will ensure that they are tackled in an efficient manner. If necessary, collaboration can start slowly and build up over time.

Table 3. UTG Further Collaboration Opportunities

SUMMARY	DETAIL
<p>Work together with appropriate other parties to develop Barcode Inter-operability across operators and modes</p>	<p>There is a need for a solution for multi-operator and multi modal ticketing on barcodes to operate across operators and equipment suppliers. This needs to replicate some of the areas of functionality that ITSO has done well at including acceptance and lossless transmission between equipment and suppliers within any ticketing scheme. Barcodes need to work across bus operators and also on rail.</p>

SUMMARY	DETAIL
	<p>There is not consensus as to which organisation is best placed to take on this particular challenge and a risk that either it will not happen at all or that it will be commenced in more than one area or scheme at the same time when only one solution can prevail. UTG members are best placed to work together and have some of the most urgent need for this particular question to be resolved.</p>
<p>UTG members coming together to arrive at solutions regarding the unbanked or less banked</p>	<p>Not everyone can access a credit/debit card. While for some this comes from their personal choice, for others it is as a result of them having less access to technology and financial instruments. They may not have a smart phone, credit card or even a bank account.</p> <p>UTG members have mostly closed their own travel centres on the basis that found that the majority of their products are no longer sold in a paper form and that information is delivered electronically. However this creates a dependency that any future ticketing system must make allowance for those who do not have access to a smart device or cEMV card and there is an opportunity for UTG to work together to identify, design and implement solutions for these customers.</p>
<p>Work together to identify possible alternatives to ITSO for concessionary cards</p>	<p>While many within the industry do not see a long term future for ITSO, especially as other technologies such as cEMV contactless start to become more prevalent, there is currently no alternative technology that could take its place. UTG would be well placed to work together to investigate other possibilities.</p>
<p>UTG members combining their legal and accountancy queries</p>	<p>Integrated ticketing is becoming increasingly complex. As described within this document there are legal and regulatory frameworks, rules and policies that must be adhered to. To be sure of the position, UTG members have engaged lawyers and accountants to provide a formal professional view. UTG members could share that advice and work together to ensure that the same question isn't being externally evaluated unnecessarily by costly external resource.</p>
<p>Collaboration on procurements</p>	<p>Procurement is a complex area where collaboration between members is taking place to some degree already but more could be done. If a procurement was necessary then the sharing of documentation perhaps via an on-line library resource would lead to savings and consistent procurements that ensured that all previous lessons learned had been incorporated.</p>
<p>Sharing Testing resource both staff and equipment as well as results</p>	<p>Testing is accepted as being a critical part of a successful smart ticketing approach. As more operators and modes are included then testing becomes more difficult. It is also important to test using as close to live configurations as possible. Inevitably there are UTG members that have test suites and systems available that are more comprehensive than are available to others. It is costly to build, staff and maintain a comprehensive test suite. UTG members could work more closely and share testing resources. This is likely to become even more of an issue as cEMV contactless inter-operability needs to be tested. There would also be the option to work closely with transport operators in regard to their testing.</p>

SUMMARY	DETAIL
	<p>Looking more strategically, testing is something that could be focussed in one or few accessible locations. A Centre of Excellence could be developed in this regard. It would need the addition of extra equipment and systems to include equipment not seen in that area. There would be a cost to others of travelling to that location but that would be offset by not needing to invest in equipment and personnel. The cost of that testing capability could be shared between UTG members.</p>
<p>Developing single solutions or rules behind validation of elements such as age or disability</p>	<p>UTG members are facing many of the same requirements as each other, even if there are regional variations. For example most schemes have provision for children to receive a reduction in fare perhaps down to free. For this customers have to prove that they are children. UTG members could collaborate on defining how this proof might be provided.</p> <p>Taking it further there is also an option for UTG members to work together to develop solutions ensuring that they are white labelled for others to use. A developed solution could have configuration to allow for regional variations, for example for authorities where someone aged sixteen is considered a child and others where a child has to be under sixteen.</p>

6. ASSESSMENT OF THE TECHNICAL AND OPERATIONAL LANDSCAPE

Requirement

“An assessment of the technological and operational landscape for smart and integrated ticketing – including a plain English explanation of the key concepts. This assessment should also describe how the technological and operational landscape has evolved over time and how it might develop over the coming years.”

Operational Landscape

Overall

Many of the regions have established smart ticketing schemes and are looking forward. Account Based Ticketing and MaaS are definitely on the agenda.

The overall objective though is to encourage more people to travel sustainably more of the time. Fares are considered to be key realising that ambition, but the service has to be of a good standard otherwise people will be reluctant to use it irrespective of the fare charged. Fare transparency and simplification are likely to lead to growth in a network and the technological solutions can then be used to make those simpler and potentially lower fares more accessible. Customers often say that they do not know the fare.

Ticketing options must be straight forward to adopt and use as otherwise it can be a barrier to take up. Technology itself should not be the driver for a particular solution as this should always be related to customer need.

Regions have built up high levels of trust with their customers and even non-users within their population. It is important that any new initiatives do not damage that trust. Brand awareness is high.

Roadmap

The impression obtained was that few UTG members had a clear roadmap in regard to their technological solutions. Solutions appeared to have been built up over time, offering choice to the customer and sometimes following the available funding sources. This has led to fragmented solutions being offered and potentially a risk of trying to please all of the people all of the time. This is sometimes driven by political aims and policies.

The lack of a clear roadmap can make it difficult to show progress and achievements.

Resource

Detailed knowledge of ticketing technologies is a specialist subject such that newcomers to the industry can find it difficult to obtain information that will inform their thinking and decision making. Consequently, there is a challenge in obtaining the right resource at a cost that is affordable. This has led to some developments in smart ticketing not being able to proceed or being delayed. The ambitions of local politicians and managers can outstrip available capacity. Rather than disappoint them, there have been instances where delivery has been promised and not achieved or descoped potentially preventing the benefits intended to be realised. The lack of a core Roadmap to measure against can make that more difficult to see.

Supplier Performance

There remains a small number of suppliers within the UK ticketing industry with potential near monopoly within the very large schemes. While there are pockets where suppliers are praised they can often be reported as being difficult to work with. Sometimes it is difficult to create a full specification for a supplier to deliver against, especially when the solution is new and innovative. UTG members want to be able to work with suppliers in a more collaborative way and the benefits of associated or in-house technical expertise supports that. While much is promoted over Agile ways of project management, its use within a traditional Public Sector procurement and operation, which tends to support a more rigid waterfall delivery method, can be difficult to maintain.

The pool of smart ticketing suppliers is currently fairly limited, so those who are successful are likely to be providing systems to a number of authorities and operators. This can lead to a lack of available resource within their teams, resulting in frustration when development is not delivered as quickly as it might otherwise be.

The lack of resource combined with suppliers that are not always aligned with scheme aspirations means that innovation is delayed or does not occur.

Different Operational Models

Not every area is the same, with differing priorities based on the modal priorities. This is then reflected in the ticketing and fares aspirations and delivery. The presence of a significant heavy rail for local commuter and/or a strong intercity influences the approaches that need to be undertaken. Heavy rail has a similar influence. In a primarily bus environment there can be greater scope for regions and operators to work together.

Cost of Transaction

Critical to operators is the cost of transaction which makes sense given the need to ensure that solutions are affordable and don't add unduly to the customer charge. There are many costs in relation to the transaction. Some are fixed such as a cost for use of or an integration of the system, and others are transactional. The Broker will bring an additional charge for evaluating multi-operator and multi-modal costs.

In addition, though, there are other costs such as credit and debit card processing costs. Alternative funding sources such as cash balances or Mobility Credits can have a lower transaction cost depending on how that funding source is topped up. Also, depending on the type of transaction they can be more suitable for a particular payment method.

There is not consensus amongst schemes as to what, if any, charges are levied to operators. While generally the capital expense is not charged to operators there are instances where amounts are charged to cover direct transactional costs e.g. credit card processing costs and in some schemes additional revenue costs such as the cost of a customer service team is recharged to operators. Some use a fixed percentage of the ticket or product price intended to be an umbrella charge to cover costs while percentages can be varied depending on the type of ticket or product being retailed. There are instances where authorities have chosen to cover all of the costs themselves often led by a political imperative that there should be no barriers to operators agreeing to take part. In this case though, it is accepted that it can be more difficult to then retrospectively ask operators to contribute towards costs.

Data Analysis

For many authorities and operators, the introduction of smart ticketing led to an explosion in the availability of data and trends. This has led to increased opportunities to understand customer behaviour and usage. Even in areas without exit readers or another way that alighting point can be identified, it is possible to identify where customers are travelling to and from – after all their product would not be accepted on their return trip if it wasn't valid.

The data can also be used to highlight issues with customer behaviour. For example, within ITSO it is possible to see when people were prevented from travelling because their product was expired. This could point to the fact that customer messaging on expiry dates could need to be enhanced.

Historically, much of the data analysis has been based upon estimates and assumptions. For example if n concessionary customers undertake x journeys then it can be assumed that concessionary customers undertake an average number of y journeys per annum. The most basic data analysis shows that while some customers make few or no journeys per day when another customer might make thirty journeys per day.

During the COVID pandemic it was possible, for example, to take advantage of the fact that every concessionary card holder is registered to understand how well the message regarding asking people not to travel had been received, at a district level.

Data is touted as being the most valuable asset an organisation can have. Some elements of future plans for smart ticketing, for example those within MaaS intending to nudge the customer, require high quality data just to work. The reality is that many regions do not have the resource available to harness this information. Datasets can be large and hold confidential information such as names and addresses. Those with the data analysis skills and access to the right tools to support that analysis often don't have the knowledge of what questions they need to be examining in order to add most value and those who know the questions often don't have the data analysis skills.

Fraud Analysis

There is a commonly held view that the focus of Public Transport ticketing should be on fraud and its detection and ideally its prevention. It is certainly the case that the addition of any new ticketing system increases the opportunity for fraudulent behaviour. However, this needs to be set against the gains that a simple straightforward system can bring – it is possible to lock down a system so that fraud is absolutely impossible – though it is likely that no one would be able to use it either. Also, fear of fraud for a particular technology must be considered against the reality of fraud for an existing technology. In a paper ticket environment reuse of day tickets by someone else who has bought it off an individual or just found it in the street is rife. The development costs to reduce or eliminate fraud also have to be considered against the potential losses.

A consistent view of what is fraud is also needed. For example, in English National Concessions there are authorities targeting elderly concessionary passholders who have moved away from their area, and actively seek to block their card, yet the area they have moved to has advised them not to apply for a local card until their existing one has expired. Card based PAYG schemes might have been intended to only buy one ticket at a time, but customers buy more than one for family members travelling with them. While that was unexpected behaviour it isn't fraud.

That isn't to say that fraud doesn't exist. Schemes have had to stop the on-bus selling of paper and ITSO season tickets using a cEMV contactless card as that card has later found to be stolen. In Greater Manchester recently, the one day ticket option was removed from the app and customers steered

towards cEMV contactless capping instead. With the availability of Social Media an obscure ticketing hack can be shared and utilised very quickly.

What is needed is a measured approach supported by evidence. This is related to Data Analysis. The right questions have to be asked and the data examined including modelling future scenarios for new developments and technologies. With the capacity issue in regions and schemes, this resource is not always available leading to a risk either financial or of delays from an overcautious approach.

Technical Landscape

ITSO Technology

The adoption of ITSO for English National Concessions in 2008 has given it a head start in regard to England. A wide range of ENCTs passes issued by more than a hundred local issuers must be accepted on bus across the country in the Off-Peak. In some areas local add-ons allow ENCTs passes to be accepted on Light and even Heavy rail as well. For many areas ENCTs triggered the first role out of smart ticketing. Certified equipment was and remains mandatory on buses in England. While there has been conjecture over a replacement for ITSO concessionary cards, including the possible use of cEMV cards, there have not been any concrete proposals as yet. Even assuming that an alternative technology was identified that was on every bus, any replacement for the current ENCTs card away from ENCTs requires primary legislation as well as the inevitable investment in systems to support issuance and the recording of usages. There is interest though in the short term of moving the concession to within a mobile phone app rather than needing the plastic card.

The current system for the issuing and maintaining ENCTs though is complicated and requires significant investment in the maintenance of ISAMs to ensure that cards from across the country are accepted. Even the most diligent scheme can make mistakes which are likely to be found when a customer complains that they have been refused travel.

Different UTG members have prioritised different solutions but many in England have sought to maximise their investment in ITSO required for English National Concessions. This has led to solutions such as Swift in the West Midlands and MetroCard in Liverpool City Region. While they both use the same core ITSO technology they have never been truly interoperable as no customer service interface exists between the two. Realistically, a customer wishing to travel on public transport would be best placed to get a card from both schemes. For transport operators though, operating across the UK, ITSO has enabled them to be able to accept products and cards from a number of areas without significant design work being necessary.

This distinction is also relevant in regard to the costs of ITSO ticketing as well as in regard to the optics around those costs. For example, a scheme with a strong concessions base and acceptance of the benefits that brings, could be seen to have only marginal additional costs. After all, the scheme would have to run a HOPS as well as maintaining an estate of ISAMs. For others, where the costs are genuinely additional, then there can be a perception that ITSO is expensive.

Even for authorities and operators that have invested heavily in ITSO, many see it as being an outdated technology which appears firmly rooted in the past. Costs can be opaque and confusing and the future vision from ITSO themselves not clear. ITSO is a monopoly in regard to ENCTs and operates in that way. In the past ITSO Board membership was split into categories with there being two Board members representing, on a voluntary basis, the English Public Sector. It is not clear how the current paid Board members interact with members from the Public Sector.

As a result of the link to ENCTS many UTG members were responsible for setting up the ITSO infrastructure initially such as the supply of ISAMs used within bus ticket machines, gates and validators. While some operators have sought to maintain their own estates, others have allowed authorities to carry on this task especially as there is a cost involved. This has resulted though, in some cases, ITSO being seen as a Local Authority technology and inaccessible to operators for their own ticketing solutions. Consequently, many operators have sought to adopt a technology that they can understand, support and control and have adopted barcodes or QR codes. The lack of a UK standard for bar and QR codes has meant that it has been challenging to introduce multi-operator and multi-modal ticketing with that at its core.

Inevitably there has been a move away from a traditional smartcard towards fulfilling via a mobile phone. This has taken the form of bar and QR codes but also ITSO functionality built into Android phones with competing solutions from at least two organisations – VISA and ITSO themselves in use. Depending on the ticketing offer available, adding it to a mobile phone has proven complex. There are new technical questions that need to be answered as well as customer service challenges. The move by ITSO into becoming a supplier has introduced confusion regarding its status as a membership organisation that would not normally be required or set up to make a profit.

The West Midlands (ITSO) and Nottingham (VISA) ITSO on mobile solutions are yet to roll out in large numbers but have been successful in testing and/or small-scale trials. Nexus have had success with their Pop card digital implementation via ITSO on mobile. The lack of volume across schemes does though present a risk that Google will consider that this is not an area that they wish to proceed with in the longer term. The fact that there is no immediate sign of Apple offering ITSO tickets included directly within the iOS wallet, within the next 12 months further diminishes ITSO's attractiveness to many.

While there is a view from many that ITSO is a life expired solution this is not a view held by some UTG members who believe that that they should maximise the efficiencies of a technology that will likely remain in English public transport ticketing for up to ten more years.

Going forward there will be more instances of MaaS type apps which will need to have ticketing at their core. The introduction of these apps does not necessarily drive a ticketing technology choice as any, or any combination, can be facilitated as required.

cEMV contactless Technology

Customers and stakeholders often ask for “more London”. In doing so they don't always understand the very different circumstances that exist in London, most significantly around TfL's ability to control and offer one view. There are boundary issues but the boundary is vast compared to other schemes. The Cubic proprietary solutions used in London were not chosen for the wider UK Smart Ticketing rollout as the ITSO spec provided inter-operability, allowing a number of suppliers to provide goods and services.

There has been a growth in the adoption by operators of the acceptance of cEMV contactless cards. The customer experience can be very different depending on the area or operator being travelled on. For example, in some areas customers can purchase a ticket or tickets for example for families or groups, where in other cases the experience is more like a London Tap and Go with the fare being calculated post travel and if necessary being capped. Some schemes offer both solutions and rely on the customer interacting with the driver to ensure that the correct choice is made.

While most authorities are keen to progress multi-operator and potentially multi-modal ticketing in order to offer customers best value and most choice there is an accepted view that multi-operator journeys make up a small percentage of journeys undertaken. Very often customers simply travel from

A- B and back again, inevitably often on the same operator, either because it is the only one operating that service or because it is the one that the customer is familiar with. Much of the push for Public Transport is for new customers to make that most basic of journey combinations. It is though, the case that Public Transport may well be more attractive to existing and new users if customers understand that for the same, or a slightly increased, cost that they can travel on another operator or even another mode. That should result in increased journeys as customers use Public Transport for additional leisure journeys where they might otherwise have used a car.

While there is already a perceived need for multi-operator ticketing, any potential increase in its uptake would strengthen the argument for systems that support that premise. Accordingly, the cEMV contactless Broker concept developed by TfWM with Project Coral is being broadly welcomed. UTG members have been keen to identify that it is essential that any such programme of works is undertaken in association with areas and schemes but critically that the transport operators are fully within the tent. Any such solution must be able to operate in tandem with existing operator systems and be affordable to operate. If multi-operator cEMV contactless capping confuses the customer then it is unlikely to be a success.

To this end it is important to consider how cEMV contactless card experience and customer support can be facilitated via dedicated transport apps, seeking to steer customers away from just reviewing their credit card or bank statement.

For many years proponents of cEMV contactless have argued that it can offer a full range of ticketing options including for children and concessions yet these offerings have yet to be fully detailed. For example, how a cEMV contactless card would provide the English National Concession on bus in a way that could support local reimbursement of concessions – especially given the fact that such journeys were free at point of travel.

In areas with single operator dominance or indeed single ticket machine dominance – for example a large Ticketer/LittlePay estate, there is a view that there will likely be pressure to introduce cEMV contactless capping across operators in advance of the timescales of the work being undertaken by TfWM and Project Coral. However, in this instance it is considered that it will be possible to integrate with the Broker solution later. This is technically possible but there is a risk that it might never happen on the basis that a solution for most of the customers most of the time has already been implemented. In addition, unless part of the initial procurement, it can prove costly to undo work that has already taken place.

TfWM is championing that the Broker solution should be multi-modal including light and heavy rail whereas the bus operators are seeking to concentrate on bus at least initially. It is recognised though that inclusion of heavy rail especially if not urban rail, will require additional work in partnership with relevant stakeholders.

Barcode Technology

There has been a rapid increase in the use of barcodes within public transport. These can be fulfilled onto a paper ticket or within a mobile phone app. Within a phone app the barcode can be dynamic and have additional security features. Barcode readers on gates and bus ticket machines do not have to be always online when validating that a barcode is valid at a particular point. In the event of misuse, the gate and ticket machine can be set to look out for future attempted re-uses.

QR codes use a different format and are intended to be read by a user's mobile phone rather than being displayed on that mobile phone though some schemes are using QR codes for Public Transport Ticketing.

Typically, the core operators and/or their ticketing equipment suppliers use their own proprietary barcode formats. Some will allow barcodes on phones only while some support paper barcodes as well. In Rail there is a standard Aztec form of barcodes agreed for inter-operability. Recently there has been a pilot of accepting PlusBus – effectively a rail ticket – on buses operated by First.

In West Yorkshire the MCard app combines Aztec barcodes for rail and QR codes for bus. The barcodes are not yet read on Stagecoach.

Account Based Ticketing

ABT is not a ticketing option in itself though it is often considered alongside ticketing types and ticketing media choices rather than being a solution that is token agnostic.

ABT is often thought of in relation to capping but it is not necessary to have capping for ABT to operate. What it represents is the passenger to be able “Tap and Go” and know that at the end of a charging period that they will be charged with the right fare(s). Examples of ABT schemes are shown in the following table.

Table 4. Account Based Ticketing

SCHEME	MODES	CAPPING	FORMAT	ADDITIONAL MODES?
TfWM Swift	Bus/Tram	Singles, 1 Day, 3 Day, Weekly. Single/Multi operator and mode Areas and Zones	ITSO	Cycle Hire and ANPR
Tap on Tap Off Leicester	Some Bus	Singles, 1 Day and Weekly Bus only	cEMV	No
Nottingham cEMV contactless	Some Bus/Tram	Singles, 1 Day	cEMV	No
TfGM	Tram	Singles, 1 Day, Weekly	cEMV	No

NB : Nottingham and Nexus (Metro products only), have on-card capping available

Extending the ABT offer beyond a pilot or small scale launch requires in many instances additional effort and expense. For example, extending to additional operators including Stagecoach will require a solution to the sharing of data across cEMV contactless estates – being addressed by the TfWM/Project Coral Programme. Where the offering of operators is incomplete, there is a danger that the customer would pay more with a Tap and Go ABT solution rather than buying an existing ticket that would be available for the same travel patter. This can lead to passenger dissatisfaction. Any such omissions must be clearly shown on any publicity and advertising.

Adding in different classes of customers such as children will require work around contactless card provision with attention perhaps directed towards prepaid cEMV contactless cards. Many schemes demand that the cards held by customers enjoying a concession such as children have a photograph on them. Alternative methods include giving ticket inspectors access in real time to Back Office system that could confirm the status of the passenger.

Adding in concessionary customers to a cEMV contactless solution would require a system that supported the England wide inter-operability as well as finance suppliers being content with transactions without a value of point of presentation.

Adding ABT via cEMV contactless in a rail environment would require significant effort and investment, not least in cEMV contactless readers to open gates and to record at PVALs together with the appropriate back office systems.

Irrespective of the token chosen, there may need to be investment in equipment such as exit readers if that is needed to understand the individual fares incurred.

Irrespective of the token chosen, customers will need a way to see their transactions and what they have been charged. This is available within both ITSO and cEMV contactless environments. The challenge in this regard is not in relation to the technology but in regard of the customer ownership and the branding. Multi-operator ABT branding could be confusing for a customer who has only travelled on one First bus in a particular week.

ABT including capping requires a capping engine to arrive at the correct amount that the customer should be charged – perhaps asking for payment direct. Depending on the complexity of the caps being applied this can be complex to design, build and even to test.

As part of the capping engine or as an additional system there is also a need for a system that reimburses operators. Both capping and reimbursement must provide transparency to ensure that there is trust that the calculations have been made correctly and correct amounts paid and received.

Given that ABT is a payment in arrears arrangement, there is an element of risk. This needs to be considered against the cost of transactions together with the customer service that is being sought. It is up to each individual scheme's rules as to the level of risk that a scheme and/or the operators are prepared to support. For example, making customers always maintain a balance of £100 would mean that they would be very unlikely to default on what they owe for Public Transport yet would likely mean that no one would take it up. Collecting small amounts very regularly as soon as they are incurred reduces risk but increases transaction fees. And for customers the research is inconclusive – some seem to prefer to be billed in as real time as possible while others prefer to wait until a number can be grouped together.

BIBO (Be-In/Be-Out)/CIBO (Check-In/Be-Out) and other variants

For a number of years there have been claims regarding the use of passive technology, typically a smart phone or wearable, to simply detect when a customer is travelling without needing to check in or out at all. Previously the proposals have not been well received as they have not detailed how the most obvious fraudulent behaviours might be prevented. In addition, there was a view that customers would not be able to, or permit that Bluetooth was on all the time, as a result of concerns over privacy or battery life. While not completely answered most people always accepted that the NHS track and trace app utilised Bluetooth and there was not significant kick back regarding battery life.

A number of MaaS app suppliers are now repeating that this would be possible via live tracking and even quoting machine learning and artificial intelligence. The removal of the need for, and the cost of, fixed ticketing equipment is too attractive to simply ignore. However, solutions such as this have been suggested by suppliers many times and countered, as the ticketing infrastructure fulfils a much wider range of roles in public transport operation, such as punctuality/time keeping and RTI interfaces.

Reduced Fare Concessions – Children, Youth, Disabled, Elderly

Much of the work around Public Transport Ticketing is intended to be barrier free or to reduce friction for customers. It is widely accepted that customers who enjoy a concession such as reduced fares will need to prove their eligibility for that concession. There are a number of different rules that children and other concessionary passengers are required to adhere to – for example a child may be sixteen and under in one scheme or area and eighteen and under in another. Some schemes trust customers declarations while some need proof. Where there is proof necessary, there are different models as to how proof may be provided which can involve automation or manual checking.

One of the core objectives of discounted travel for young people is to encourage children to become Public Transport natives ie understand and use the Public Transport at an early age so they are more likely to continue as Public Transport users in later life.

7. SUMMARY OF RELEVANT POLICIES AND INITIATIVES

Requirement

“A summary and assessment of recent and current policy and initiatives of Government and other key players on smart and integrated ticketing (including TfN, the rail industry, the bus industry and major operating groups) including any lessons that can be learned from previous approaches (either overall or by organisation). This should also identify any particular risks or opportunities that arise from existing initiatives in relation to how through intended or unintended consequences they might facilitate or block future options for city region smart and integrated ticketing.”

Department for Transport

It is not clear what DfT’s role is within this area especially, in regard to bus – there is a perceived greater interest and involvement in the arena of rail.

ITSO has recently renewed its licence with DfT for fifteen years but actually what does that mean given that they are far from the only ticketing option? There was an opportunity for DfT to get ITSO to be the national standard for other ticketing standards such as barcode and even cEMV. As that didn’t happen, other solutions need to be put in place that lack that “Approved by DfT” badge that ITSO can wear for its own core solutions.

While understanding the need for proper financial probity the UTG responses highlighted that the work involved for bidding for money, receiving that money and reporting on its use does require effort and resource to access. The stop start nature of the funding opportunities can make long term planning difficult. It is always necessary to consider that funding is rarely available for revenue costs.

Bus Service Improvement Plans (DfT)

Most authorities have provisionally allocated parts of successful BSIP awards to reducing fares. This is intended to support existing customers to make more journeys as well as attracting new customers undertaking new journeys. It is intended that these reductions will increase the patronage to the extent that revenue increases despite lower fares.

In the West Midlands, National Express lowered day ticket and season ticket prices as an experiment in mid-2021. They reported that they had seen a modest increase in revenue. Reductions in fares should not be to the extent that they encourage anti-social behaviour when bus passengers are not travelling anywhere specific. In addition, reductions in fares cannot lead to the unintended consequence of increased capacity being necessary.

Other uses of BSIP being proposed regarding ticketing include the elimination of multi-operator fares to match the individual operator fares. This could then lead to simplification of fares with less options for the customer to choose from – at no increased cost.

The BSIP funding is insufficient for these fare reductions to be permanent unless there is the increase in patronage that is hoped for. This represents a risk that if the patronage increases are not seen then fares could have to increase substantially.

Project Oval (DfT/TfL)

As a part of our research we found that knowledge of Project Oval wasn't strong. Where there was concern it was around the new border that Project Oval would create but not felt to be a large concern given that the regions would not directly border onto the extended PAYG scheme created by Project Oval.

cEMV Contactless PAYG Ticketing in the Midlands and the North (DfT)

In late 2021 DfT announced funding of £360m for the urban areas of rail in the Midlands and the North. The announcement suggested that *“Over the next 3 years, the government will roll out contactless pay-as-you-go ticketing across the commuter networks of the Midlands and North – introducing London-style price caps and greater integration with local bus and tram networks³.”*

In principle this initiative is to be welcomed. Though there are questions regarding the detail. For example, what is seen as the commuter network and how does that marry up with the geographic areas that UTG regions in the Midlands and the North are developing for? What is envisaged will be the solution for greater integration with local bus and tram – is this tied to the TfWM/Project Coral work?

Transport for the North

Although there was initially support for the TfN Abbott capping model in principle, it became clear that the regions were in a similar position to the operators in not fully understanding what was being proposed and not feeling part of the design. Ultimately, while it might have been possible to allay the concerns of the regions without the operators being on board, then the solution was unlikely to be a success.

The Broker Solution - TfWM/Project Coral

Our research showed that knowledge, of the UTG members, of the cEMV contactless capping solution was not strong but the broad concepts were understood. Concerns regarded the time to market and paradoxically whether there was actually a real need in many areas for most customers. The overwhelming concern was around operators' engagement and as such the involvement of Project Coral was welcomed. Some regions do take revenue risk in areas such as subsidised bus services and Heavy rail so need to be involved *“wearing two hats”*.

Everyone understood that affordable transaction fees would be critical as otherwise operators wouldn't adopt it.

The involvement of smaller bus operators and multi-modal will be an area of focus to the regions. Otherwise there is a risk that Project Coral can be seen as a vehicle for the larger operators only.

Several UTG members with a predominately Ticketer/LittlePay estate were keen to take advantage of the Ticketer offer. This provides a risk that this becomes the dominant supplier and that work done in one area is charged for again for another area or that the solutions are actually different in different areas.

The lessons from the TfN programme will have to be incorporated within the TfWM/Project Coral broker solution programme if it is to be completed successfully.

³ <https://www.gov.uk/government/news/360-million-investment-to-transform-rail-ticketing-across-the-country>

Operator Engagement

Operator Engagement can be a challenge. Key operators such as Stagecoach, First and Arriva can operate across England, Wales and Scotland. When UTG members are working with the larger operators they often suggest that one of their national policies does not allow a particular path. It is also the case that operators can be reluctant to agree to a solution or arrangement that they have agreed to elsewhere. This may be them seeking to protect their market share and make their life as easy as possible but also may reflect that agreement in a particular area was based upon entirely separate factors. UTG respondents were realistic as to how hard individual operators had worked to create their own brands making an integrated brand, like TfL complex. In addition, the smaller geographic area that UTG members cover will mean in many cases that a bus would operate in more than one of their areas and that multiple brandings would be confusing.

Operators can also have a different view of the merits of different ticket types and solutions. For example, while Stagecoach are content to accept barcodes on mobile devices with their inherent increased security over paper tickets, they have articulated concerns over the use of paper tickets with bar or QR codes. Other operators are accepting a wide range of paper ticketing with barcodes.

Acknowledging UTG Expertise

There is a large body of experience across UTG and DfT should be encouraged to draw upon this expertise both as a group and from individuals when formulating policy or making decisions. Closer collaboration across central and local government can ensure that there is a greater opportunity to make meaningful changes that are realistic and deliverable.

UTG Areas and Other Regions

It is accepted that authorities and other UTG members could inadvertently introduce issues and challenges when focussing on their own areas. Public Transport passengers don't recognise borders between areas or even countries. Without there being a recognition that these schemes cross boundaries this can lead to customer's not understanding. This is further complicated by the fact that national bus operators have their own boundaries which may be geographically larger and very often do not match the ones used by UTG or other authorities.

Even with the plans for franchising there will always be the issue of a boundary. For example, while the area covered by Greater Manchester is large and could be branded and marketed as one, there will always be buses arriving from towns and cities nearby.

8. SMART TICKETING ASPIRATIONS BY UTG MEMBERS

Requirement

“A summary of the aspirations, progress and obstacles (and the journey they have taken so far) to smart and integrated ticketing of each of the seven full members based on structured interviews.”

Transport for Greater Manchester

Franchising – much of the focus in Greater Manchester is in the area of franchising. This will be the region that others will look to understand what went well and what lessons can be learned. Effort is being applied to the challenge as to what happens when the franchised area is entered by a bus from another area but this is felt not to impact too many routes.

Metrolink has seen less fare evasion with an increased focus in Tap on and Off with less opportunity for customers to not buy tickets or products. The day ticket was recently removed from the app as customers were only completing their purchase when at risk of being identified by revenue inspectors.

Greater Manchester has an extensive ITSO powered smart card solution which is presented under the “Get me There” and “System One Travel” brands. These allow travel on bus and/or Metrolink with a wide range of options for adults and concessions. Stagecoach smart cards are also widely accepted in the region.

The Bee Network is intended to pull together bus, tram, cycling and walking into a fully integrated system with rail to follow later.

While the immediate focus is on franchising there is also a need to meet the mayoral ambition for reduced fares as early as September 2022.

Transport for the West Midlands

TfWM with Swift are proposing to continue to develop the Swift estate including strengthening the Swift Go Account Based Ticketing.

Part of the measures being introduced as part of the BSIP funding will include a reduction in the number of ticket types available within the region and multi-operator travel being offered at the same price as for a single operator. This is intended to stimulate demand so there will not be a financial loss to customers.

Seeing the benefit of the MaaS functionality offering additional modes and single payment options, within the current TfWM Swift App they are about to award a tender for a new MaaS app covering all modes and operators in the region.

Rail is a vital part of public transport within the West Midlands and as such TfWM is seeking to work with rail stakeholders such as DfT, RDG, GBR and TOCs to develop solutions around current ITSO Account Based Ticketing bringing Swift Go to the rail network as well as cEMV contactless capping. Working with these key stakeholders is intended not just to introduce solutions for the West Midlands but solutions that can be applied elsewhere.

As described elsewhere in this document TfWM are leading the work with Project Coral to develop and introduce the Broker model for cEMV contactless transactions.

Merseytravel

Merseytravel have also committed to franchising as their preferred operating model and plan to use BSIP funding to reduce fares.

There is an ambition for Tap and Go fares with best value as a London style ticketing offer, using a variety of tokens. Within an existing ITSO based approach MetroCards are replacing Walrus cards that remain valid. A wide range of tickets are available for all age groups. For a small fee a person over sixty can obtain a smartcard enabling them to travel free on buses, trains and Mersey ferries. This is available before they are eligible for their standard ENCTs pass.

Unlike other UTG members outside of London, Merseytravel is unique in actually owning the franchise for the rail services.

Nexus

In addition to a full range of smart tickets for customers similar to other areas, Nexus also offer the Gold card to ENCTs card holders that is actually added to the ENCTs pass to allow for travel on Metro as well as a ferry and a rail service.

Recently Nexus have launched their POP PAYG for Metro via the ITSO on mobile solution. This allows the full functionality available including capping via the Google Pay wallet solution. On bus, Nexus' PAYG offering is used to purchase ticketing.

Nexus is considering the steps necessary to move to Account Based Ticketing given that the capping opportunities on card within ITSO have a limited number of permutations.

In common with other areas, Nexus would like to move to Tap on Tap off via cEMV contactless but the Metro infrastructure does not have cEMV contactless functionality. To this end they are members of the group, headed by Transport for the North, looking at introducing cEMV contactless onto Heavy rail more widely.

Nexus is another area with a strong ITSO ticketing presence with PAYG and season tickets available for a range of customer types.

The BSIP bid is focussed on fare reductions with daily capping for young people and regional multi-operator and multi-modal caps having been identified with the possibility of these being delivered through an ITSO based ABT system.

Transport for London

London continues to promote cEMV / contactless as the simplest solution for public transport ticketing. This will continue to include the Oyster Card as a means of delivering the same benefits to the unbanked, those users such as children who do not have cEMV cards or those unwilling to use their cEMV card or its equivalent on a smart phone or wearable.

Project Oval, which is DfT funded, will extend the PAYG capping area to an additional 200 stations in SE England thus increasing the customer base and attractiveness of cEMV contactless (it will not expand the Oyster card area). Fares in the expanded area will remain as set by National Rail but will allow for greater passenger convenience and integration with fares for travel within London.

One of London's greatest achievements has been their recognition of the benefits provided by the data both for planning but also as a tool to manage fraud and ensure that users do not exploit the loopholes that any automated system might allow if it is assumed to be 'unsupervised'.

Nottingham

Nottingham has been at the forefront of using ITSO to the maximum extent of its capabilities with the ITSO based Robin Hood scheme offering multi and single operator capping across bus and tram services with the balance held on the card. That same capability is now sought from cEMV cards but at present is only possible with operators who use Init equipment which (Nottingham City Transport and the Tram). Wider expansion is now dependent upon the work by TfWM and Project Coral.

The East Midlands was a significant beneficiary from government funding for MaaS scheme development and this is now being worked up in close partnership with the existing ticketing scheme to ensure that the benefits are maximised and expansion of the integrated fares and payment means becomes possible.

West Yorkshire

As a partner in the development of Yorcard, West Yorkshire has a considerable smart ticketing base that includes app based MCard which allows Under 19 ticketing and multi-operator/modal products. Its development has allowed for better relationships with customers through the app and is seen as a key part of future ticketing development. Future enhancements being considered include embedding cEMV within the MCard app and some form of fare rebate for poor service quality.

South Yorkshire

South Yorkshire has only recently elected a mayor and is now undertaking a formal review of the opportunities offered by franchising but in the medium term will continue to rely on the enhanced partnership while that assessment is undertaken.

The ongoing development of fares and ticketing includes the introduction of Tap and Cap, the elimination of multi-operator premiums for products. Within this, ITSO remains a key element but with Stagecoach as the dominant operator (bus and tram) development in the longer term is likely to include other tokens subject to ensuring that the unbanked and other groups are not disadvantaged.

Transport for Wales

TfW is in the process of awarding a contract to Visa for a multi-operator/modal cEMV pilot system with capping between Cardiff and Newport for delivery in 2023. This will ultimately be deployed across both rail on the South Wales mainline and the Valleys network. Revised and simplified fare structures based on distance are being developed for bus and rail with the intention of using single leg pricing in all urban areas allowing returns to be eliminated and replaced with daily and weekly caps.

All buses in Wales are now cEMV capable and are in the process of getting exit readers.

TfW is also delivering a Ticketer only multi-operator cEMV pilot in North Wales to test both customer reactions and behaviours to tap-on/tap-off payment and the operator revenue apportionment mechanisms required for multi-operator ticketing. Some operators are already live with their own ticketing and the multi-operator product should go live during Summer 2022.

West of England Combined Authority

The Bristol BRT system offers off-bus payment and ITSO based products. A MaaS scheme for the combined authorities is being procured with tenders due to be returned during summer 2022.

Transport Scotland / SPT

Two separate systems are operated at present.

SPT providing commercial and multi-operator ticketing in the Glasgow region including the Glasgow Subway which has offered ITSO ticketing for several years and the multi-operator Zonocard will be moved to an ITSO platform later in 2023.

Transport Scotland oversee all ITSO based concessionary cards in Scotland but these are issued by local authorities with Transport Scotland administering the ITSO environment. The rail operation also overseen by Transport Scotland has its own ITSO environment (separate from the RDG back office) but it is not known if this will be aligned with other TS systems in the future.

Translink

This is a proprietary Flowbird smart card system first implemented in 2001.

A new ticketing system from Flowbird that covers all bus and rail operations in Northern Ireland is in the process of being implemented. This includes both off-bus ticketing for the BRT in Belfast and cEMV capping for the wider network.

Existing smart products will be rationalised but not replaced entirely.

9. SUMMARY OF WIDER LEGISLATIVE AND REGULATORY BARRIERS

Requirement

“A summary of wider legislative, vested and regulatory and financial barriers to simple and integrated multi-operator ticketing.”

Legislative Barriers

Block Exemption

The Competition Act of 1998 deters agreements between businesses that might otherwise stifle competition unless four conditions are met with the onus on the company – in this case the Public Transport Operator – that the conditions have been met. Given that this is a high hurdle, the Act creates the opportunity for the Secretary of State to allow an exemption – “Block Exemption”. It is this Block Exemption that allows ticketing schemes not to fall foul of the Competition Act.

However, the Block Exemption is limited to certain ticket types only:

- Through tickets
- Multi-operator individual tickets (MITs)
- Multi-operator travel cards (MTCs)
- Short-distance add-ons
- Long-distance add-ons

This limits the application of the Block Exemption from ticketing options that would be desirable. For example, it does not allow the agreement of price for a single ticket on multiple operators.

The Block Exemption expires in 2026 and was subject to review in 2021. That review was intended to investigate whether the Block Exemption was still appropriate, fit for purpose and whether it covered elements such as developments in combining micro-mobility options within a MaaS solution.

2017 Bus Services Act

The 2017 Bus Services Act also includes provisions disapplying certain aspects of competition law in respect of Enhanced Partnership and franchising agreements made under it. It is under these powers that TfWM were able to offer limited partnership route ticketing between National Express and Diamond.

The focus for BSIP is, in many cases, reduced fares and multi-operator fares for the same cost as single operators. BSIP awards were made on the basis that they would be delivered under either Enhanced Partnership or franchising agreements.

For Multi-operator ticketing offers covering a wider geography than Enhanced Partnership or franchised areas there is a risk regarding agreeing transaction charges with operators. It would potentially not be lawful to agree charges with operators together and these would have to be approached individually.

The Concessionary Bus Travel (Permits)(England) Regulations 2008

Separate legislation laid out how English National Concessions would operate for its introduction in April 2008 but this Act of Parliament describes precisely the format of an English National Concessions Card. This was introduced because the Concessionary Bus Travel Act 2007 does not require ENCTS card to be read smartly and that they can also be used as flash passes to show bus drivers. Given the very large number of authorities issuing passes this meant that drivers only had to recognise two types of ENCTS pass – one for the elderly and the other for eligible disabled travellers. The pass design includes a hologram and companies that print ENCTS cards have to account for their hologram usage.

In a modern world with more people having access to a Smartphone it would be technically possible to virtualise the ENCTS card. Technically this could be achieved, on an Android phone at least, using the ITSO on Mobile functionality. Consideration would then have to be given to security and photos but challenges could be overcome. Offering this on Android could increase the interest from other mobile phone wallets.

Currently the legislation does not allow ENCTS cards to be on phones or any other format other than ITSO.

Financial Barriers

Elsewhere in this report the challenges in regard to separate providers' cEMV contactless card schemes working together have been listed. Credit and Debit card transactions need to be very secure and there simply isn't the process and systems available off the shelf for two retailers to operate together in regard to combining a customer's transactions and potentially capping their transactions and collecting amounts due in one amount.

Where the equipment and/or provider are the same, for example Ticketer and Littlepay, this can be achieved within their build. Instances where different equipment and providers are in use will require a solution such as the Project Coral/TfWM Broker solution.

ITSO

Although the details of ITSO are outlined elsewhere in this report, it is also important to be aware of the requirements of ITSO members to keep to their obligations within the ITSO membership and the certification that their equipment holds. It is, however, true that ITSO have, in the past, lacked will or capability to enforce against a breach of those requirements against any large or influential member organisation.

Rail Ticketing and Settlement Agreement (TSA)

The TSA represents a lengthy document (the core document is 417 pages long) relating to the carriage of passengers and settling of tickets. Any inter-operability with Rail needs take account of the TSA. Local agreements are possible.

For ABT Rail is still developing a Master and Local agreement. This is being pursued via the Nations and Regions meeting run by RDG.

Operator own Restrictions

Many operators still insist on a photograph on a smart card even for full fare paying adult passengers – yet not normally on an app. This can then present itself as a barrier to the adoption of ticketing technologies that require a photo to be present. Faced with this barrier a customer may find an alternative ticketing option or make a less sustainable travel journey choice such as driving their car.

10. SMART/INTEGRATED TICKETING AND MAAS

Requirement

“The relationship between smart and integrated public transport ticketing and providing access to other modes of transport including taxis, hire cars, rental bikes, e-bikes and e-scooters (sometimes referred to as MaaS).”

MaaS and Ticketing

Depending on your definition of MaaS, it is much larger than just Public Transport ticketing. However, to be effective, the identifying of, purchasing and use of Public Transport ticketing is likely to be an absolute critical element for MaaS to succeed. Without that, customers would have to resort to finding alternative methods to purchase their ticket. It is more likely that customers in that instance would, in future, miss out the MaaS app entirely and just go straight to the ticketing system that they have identified.

MaaS in its simplest form would enable a customer to plan a journey then be guided as to what ticket or fare they needed and then be given the opportunity to purchase that fare. Customers who knew their ticket choice or just wanted to renew their existing product would be able to do that without needing to visit the Journey Planner.

In order to reduce the barrier to the take up of MaaS, it is likely that the solution would offer some of the functionality without the customer needing to have logged in to an App, or possibly via a light login by using a social media account details. This would mean that a customer could save time on their first interaction with the MaaS app. There would be an encouragement for the customer to set up a full account though as this would maximise the data analysis available. Experience from existing schemes suggest that customers see the need to sign-in as a barrier to them accessing public transport. While it is unlikely that they can be forced to do so, there may be opportunities with incentives to encourage customers to share their details.

For any customer wishing to take advantage of a concession – whether an entitlement or by purchase of a discount card such as a rail card – then logging in would likely need to be mandatory. The MaaS App potentially supported by Back Office functionality to understand any discounts that customer enjoyed could then be taken into account when fares and tickets were offered.

Payment within MaaS

Customers can already build their own MaaS journey. With effort they can plan a route potentially including the use of car parks, bikes or e-scooters and other modes. A MaaS app provides all of these in one place so they do not need to expend that effort. Also, it is likely that they do not want to register their details and their financial credentials in more than one place. Thus, it is sensible to offer payment within the MaaS app using a single payment source. This is especially the case when a customer will need to pay for more than one operator or mode to complete their journey. An efficient Journey Planner can show many different legs of a journey but it would be very frustrating if the customer then had to buy several different tickets potentially from several different payment sources.

Depending on the payment amount, there is likely to be additional work necessary around acceptable risk for high value options. For example, while a MaaS provider might be happy to underwrite to those operating a bike hire scheme that their registered customer was of sufficient standing to hire a bike, they would be unlikely to offer such a guarantee for a customer seeking to hire a Mercedes.

Capping and Incentives within MaaS

If a scheme or a region wishes to include additional modes within a prepaid season ticket then it is logical that there is a single payment source. For example, if a customer had a weekly bus season ticket with two free cycle rides and actually used the bus and made three cycle rides then recognition would be needed that they had paid for most of the travel and only needed to pay for the remaining cycle ride. This is achieved because a single system knows what the customer has undertaken and what ticket coverage they had for those journeys. Multiple payment options would be confusing for the customer and potentially require amounts to be refunded.

The same logic could be used within the calculations of arriving at a cap with the final capped amount being charged to a single payment source.

Via the Journey Planner within a MaaS app there could be an opportunity for the capping engine to offer a view in advance of what a customer would pay if they were to undertake the journey(s) that they were planning.

Opportunities for Public Transport from MaaS

There can be a view from traditional Public Transport operators that adding in additional modes could dilute the number of journeys that they would have otherwise seen. If only existing Public Transport users make only the same number of journeys but now move some of them to other modes then that would undoubtedly be true. The objective of every MaaS solution being proposed though is that it being available will increase the number of journeys made by existing customers who potentially will use their cars less but also to encourage new users into the environment for whom Public Transport wasn't seen as attractive. For example, the availability of Taxi within the same app with the same payment mechanism is unlikely to result in a wholesale move from catching a bus to getting taxis but could encourage a traveller who currently uses a car because of a fear that they might miss the last bus and be stranded.

Customers may be directed towards a different mode for certain journeys but allowing them to remain in the traditional Public Transport arena.

One key area where there is potential benefit to Public Transport is around car parking. With knowledge of a customer's parking transactions, it is possible to nudge them towards Public Transport or more Public Transport. For example, a customer who regularly parks at a station and then uses a rail season ticket could be nudged towards a bus and train season ticket. A customer who uses a bus season ticket for work but parks at their local leisure centre could be encouraged to catch a bus to the leisure centre as well. Incentives could be set that would encourage these different travelling patterns. We know that many customers take up a particular type of ticketing as a result of word of mouth recommendation from friends or family. Thus, even the nudging that encourages more journeys from an existing customer could create additional journeys from the inclusion of additional travellers.

Subscription Services within MaaS

MaaS isn't a prerequisite for a subscription service that would offer unlimited travel on stated modes in a stated area for a given period of time but would be a natural vehicle for that to be provided and visualised for the customer. The challenge in that regard wouldn't be the technical provision but the pricing that would apply.

APPENDIX A – DETAILED TECHNOLOGY COMPARISON

ITSO

Concessions

While ITSO as a smart technology has been in use since 2002 its initial growth was tied to the extension of the off-peak concession available on bus for the elderly and eligible disabled to enable them to travel anywhere in England in 2008.

Issuing concessionary smartcards in an ITSO format allowed the cards to be issued and controlled locally but accepted on bus ticket machines nationally. ITSO was designed with inter-operability at its heart and back office systems and processes allow an authority to see where in England their cards have been used as well as where visiting concessionary pass holders had originated from.

ITSO is recognised as being secure and uses an ISAM in bus ticket machine and other public transport scenarios such as rail gates. An ISAM is a physical chip that encrypts and decrypts the transactions that it sees.

Designed as a lossless systems ITSO works by batching data stored on the ISAM which is transmitted to the Back Office (termed a “HOPS”), sometimes daily over Wi-Fi but more recently many bus ticket machines transfer data more regularly including real time over mobile networks. Only when the back office has received that data and acknowledged that receipt to the ISAM does the ISAM delete that batch.

If required a card can be blocked, for example when a pass holder has reported it lost or stolen. The HOPS can transmit daily or more often to ticket acceptance equipment a hotlist containing the card numbers that need to be blocked. When the card is next presented to a reader it is blocked. Messaging on the reader means that the customer and front line staff such as drivers will know that the card has been refused. If it is presented again this will be visible to ticket machines, gate lines and front line staff and travel can be denied.

Since the English National concession is only valid as standard on bus after 09:30 Monday – Friday and all day weekends/Bank Holidays the bus ticket machines are set up to recognise that time constraint and refuse travel when necessary.

Some local schemes have allowed their card holders additional modes such as light or heavy rail in their area either for free or for a small charge as well as allowing some passengers to not be restricted by the 09:30 start time. Bus Ticket machines and rail gates etc have been configured to accept those variations from the standard.

Some English authorities have issued their own ITSO smartcards to support those who are 60 years old, offering local concessionary travel only. This is to ensure that the customer does not try to use their pass elsewhere where it isn't valid.

Ticket machine suppliers and other equipment that interacts with ITSO must be certified by ITSO as meeting the requirements of the ITSO specification. This ensures that inter-operability can be maintained.

ITSO is also used for concessions in Wales and Scotland though both manage that as a national scheme rather than the local approach adopted in England.

Introducing even concessionary travel via ITSO has not been without challenges. This was especially the case in the earlier days of ITSO with challenges regarding Ticket Machines and ISAMs. The English policy of allowing local issuance of concessionary cards means that an ISAM must be set up to accept more than 100 card types and updated over time as the security key for each card type expires.

There have been instances where data in an ITSO environment has been delayed or that it has gone missing although these instances are not thought to be high in number.

Commercial

The experience and progress of an individual scheme's delivery of national concessions can be seen to colour the view of the scheme as to whether or not ITSO has been seen as having a place as delivering a commercial single or multiple operator and modal ticketing offer.

Effectively national concessionary scheme providers fell in three camps:-

- Those that had no interest or perhaps authority/presence to set up multi-modal ticketing;
- Those that had experienced the challenges of an ITSO concessions implementation and did not want to expand the offering any further and bring any further perceived complications into their plans;
- Those that had experienced the challenges of an ITSO concessions implementation, resolved most issues, felt ready to tackle any new ones and wanted to see their effort and their investment to date to be used to the full.

In addition, large and small public transport operators have been able to develop their own smart ticketing solutions utilising the ticket machines and ISAMs within their estates. The ISAMs may be owned and maintained by the operator or by an authority.

In a similar manner it is possible for public transport operators to have their own HOPS. ITSO's built in inter-operability results in the required information messages being transferred between HOPs as is needed.

ITSO has not fully cracked the question of inter-operability. While it is true that in theory any ITSO product can be added to any card in the country this is mostly prevented by retail systems that are card specific as schemes have cards designed for specific purposes or local rules such as demanding a photo for season ticket cards. In addition, there is no way for the customer service representative for the area or operator who issued the card to provide support for a customer travelling outside of their area of knowledge. In reality though, since most schemes do not charge for a card it is possible for customers to have a card for more than one area.

The ITSO specification does not detail how commercial smartcard schemes and offerings should be constructed. In order to arrive at some consistency a group of ITSO members made up of authorities, operator, suppliers and experts derived best practice rules. It is to this template that most schemes have been designed.

The exception is rail whereby there are clear demands and requirements upon Train Operating companies and authorities wanting to offer ITSO based ticketing in a rail environment.

The advent of Smart ITSO ticketing has enabled authorities and operators to develop products that cover a wide range of validity periods. For example season tickets can be valid for periods of one or four weeks or longer. Pre-covid direct debit tickets that never expired – until the customer wanted to stop the Direct Debit or failed to pay – were very popular and easy to understand. Season tickets can have a fixed start date or commence the first time they are presented to a ticket machine or gate.

There are also products available that allow the purchase of a number of journeys or a number of days. In the case of the day version one day is decremented on the first instance of a day being presented to a ticket machine or gate. On subsequent presentations the ticket machine or gate recognises that there is a season ticket valid for one day so no further days are decremented.

There are a number of ways to purchase a commercial ITSO smart product. The first is via an online portal requesting a new card which can be printed locally or more usually by a Bureau service. Cards are normally not charged for but in most cases there is a requirement to pay for a product for provision to that initial card. Depending on the scheme makeup cards may also be obtained from retail outlets such as Paypoint or Payzone either directly or via a barcode solution such as the one used by National Express in the West Midlands to issue Swift cards. ITSO cards can be vended from a Travel Centre or shop where they are in place and also via some vending machines.

Once a customer has a card they should not need to obtain a new one regularly as they are robust and are encoded to last ten years or more. Adding an existing product or topping up PAYG may be completed at the same venues that supplied cards. If the product is purchased on a web portal then it is necessary for the customer to actually load that to the card. To that end authorities and operators have developed apps that will add the product or PAYG amount to that card. The same app can be utilised by Android and iOS phones that have NFC capabilities. Depending on the app design the customer has to simply hold the card to the phone while the app is open or will, in some instances, need to trigger the app for check for updates. The same app will detail what is on a particular card showing details such as the product name and its expiry date. The other way that a customer can collect their product to their card is via Action Listing. This is the process where the details of the product or PAYG top-up are sent out in lists to the ticket machine or gate within the scheme. When the card is presented it then has the product loaded to the card in a similar way to if that card had been presented to a collection app.

ITSO schemes can also allow a customer to load a cash balance onto a card. Adding PAYG to a new card or an existing one can be accomplished by following the same steps described for product purchase above.

When an ITSO commercial product is presented to a ticketing machine or gate the device in combination with the ITSO will de-code what is loaded onto the card. It will then examine to see if the product is valid here and now. For example, a product that has been sold as Off-Peak because it is not valid before 09:30 Monday to Friday, will be refused by the ticket machine at 8am on a Wednesday. The same logic will mean that the product will be accepted by the ticket machine at 8am on a Saturday or Bank Holiday, as it recognises that they fall under the definition of Off-Peak. Where a product has a geographic limitation then the ticket machine can correctly refuse it if presented outside of area. This is also the case if it is presented at the last stage or stop of that geographic restriction if scheme rules are that journeys must start and end in that geographic area. This is as a result of the ticket machine “understanding” that there is no valid option for a journey to be undertaken using that product.

The ticket machine will also check that the product has started if it has a fixed start date and that it has not yet expired. It is possible to have more than one ITSO product on a card. Ticket machines and gates tend to look for the first product that is valid for a journey that starts at this location at this time.

The entire card could also have been blocked for example when it has been reported lost or stolen. In this case the ticket machine does not look past that to see the status of any products and travel will be denied.

If the card contains a PAYG balance, the customer can purchase tickets off a bus ticket machine for themselves and/or others travelling with them. This is accomplished by asking the driver for the tickets

needed. Once a ticket has been purchased it will be shown to subsequent drivers like any other ticket and the PAYG card is not used again. The ticket produced when PAYG has been used can show the customer the remaining balance on their card.

Nottingham and Nexus have introduced a variant of PAYG where the card uses ITSO functionality at the time PAYG is presented in order to carry out capping dynamically during the day to provide best value. There are limits though as to how many caps can be calculated using this method.

For bus journeys, the journey record (transmitted to the HOPS via an ITSO message) will include details of the journey that are known to the ISAM. These would include card number, service number, time of day, ISAM number (from which Back Office systems can derive which bus the journey happened on), driver number and where the journey commenced. While historically this information was only held at a Stage and Stop number – that unhelpfully could differ between operators – most ticket machines now use GPS to know the bus location and report boardings back using NAPTAN codes. These are the unique code given to a stop and accessible via a download from the DfT. Where a scheme includes Tap off readers, then a second ITSO message will show the NAPTAN at the stop where the customer left the bus.

Within Rail the ITSO message includes the concept of the start and end of the journey. Where no start is detected then the gate creates a dummy transaction with the location of the start of the journey the same as the end.

If for any reason a card or a product is refused for travel then two things should happen. Firstly there should be an intelligent message presented to the customer and the driver or other front line staff. Many of these would be clear to customer and staff – for example product expired or card/product blocked. In addition, a message should be sent to the HOPS via the ISAM explaining why the card or product was refused. This can be helpful when providing customer service or undertaking wider scheme management. For example, if a large number of customers are presenting expired products, then perhaps the messaging around expiry dates needs to be strengthened. This reporting is not infallible though. Creating these messages at all is an optional part of the ITSO specification thus not all ticketing devices actually do it. There are also instances when the device simply doesn't know why a successful transaction wasn't created – this is common when a card is presented to the device and removed too quickly. The actual contents of the message displayed to customer is generally usable configurable hence when a large operator changed every failure message to say "Refer to Driver" it helped neither customer nor driver who had no information as to what might have gone wrong.

To travel at full fare there is little incentive or requirement for a customer to prove who they are and to provide personal details, including a photograph. However, there is broad consensus that where a customer wishes to take advantage of a concession – for example half fare for children – that it is reasonable that they should prove that concession. ITSO cards can be used to provide visual proof that a child is entitled to half fare but also the technology allows the ticket machine or the retail device to recognise that the card is held by a child and offer child products. That entitlement can be set to expire – for example on their sixteenth birthday and at that time it will no longer be able to be used for the purchase of child products.

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The SYSTRA logo is rendered in a bold, red, sans-serif typeface. The letters are thick and closely spaced, with a distinctive design where the 'S' and 'Y' have a slightly irregular, blocky appearance. The 'A' at the end is also bold and consistent with the rest of the font.