

Commission's Expert Group on Urban ITS

Draft Guidelines
"Smart Ticketing"

Version 1

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Abbreviations and acronyms

Abbreviation	Description
3DES	Triple Data Encryption Standard
AES	Advanced Encryption Stand
B2B	Business To Business
AFIMB	Agence Française de l'Information Multimodale et de la Billettique
B2C	Business To Customer
CRM	Customer Relationship Management
EFM	Electronic Fare Management
ERP	Enterprise Resource Planning
ETSI	European Telecommunications Standards Institute
GSMA	Groupe Speciale Mobile Association
ID Card	Identity Card
IEC	International Electrotechnical Commission
IFM	Interoperable Fare Management
ISO	International Organisation for Standardisation
ITS	Intelligent Transport Systems
ITSO	Government-backed, non-profit organisation which defines and develops UK-wide technical specification for Smart Ticketing
NFC	Near Field Communication
OTI	Over The Internet
PT	Public Transport
RF	Radio Frequency
RSA	Rivest Shamir Adleman Algorythm
ST	Smart Ticketing
USB	Universal Serial Bus
TLS	Transport Layer Security

VDV	Verband Deutscher Verkehrsunternehmen
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References

ID	Description	Source
[1]	EUROPEAN COMMISSION: WHITE PAPER - Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system; Brussels, 2011	http://ec.europa.eu/transport/strategies/2011_white_paper_en.htm
[2]	Civitas Initiative	http://www.civitas-initiative.org/index.php?id=69
[3]	Results of the UITP congress in Dubai 2011	www.uitpdubai2011.org/

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1. Summary

Smart Ticketing has been a trending topic at least over the last decade, but what does the term “smart” mean in this context? When using this term, we’re generally talking about new technologies and integration of services not directly linked to the basic functions of tickets. The main issues of Smart Ticketing are:

- Propose complementary services to users in relation with their mobility
- Modify relationship between Public Transport user and his/her ticket as also between Public Transport operator and its tickets
- Improve overall efficiency and image of Public Transport network as also the depth of data created through usage

Smart Ticketing could permit to contribute to the overall improvement of the public transport network level of services, image, accessibility, with the main aim to facilitate and/or increase the use of public transport and so contribute to the overall political goal of developing a sustainable transport policy. **Smart Ticketing though is NOT necessarily about having ONE ticket for your journey but having ONE wallet for SEVERAL tickets.**

There are a number of potential implementation choices within the guidelines for Smart Ticketing:

- Smart Ticketing using a dedicated application
- Smart Ticketing based on the virtualisation of tickets
- Smart Ticketing based on secure identity and back-office processing

One of the main trends that could be extracted with the development of Smart Ticketing is that we are more and more personalising the “ticket”, the contract used by the final user. The differing needs of groups or communities of people are becoming a challenge for the implementation of the Transport and the Fare Policies.

Implementing Smart Ticketing also means thinking of the **stakeholders and their needs**. To date, the main stakeholders are clients, politicians and authorities, public transport operators, scheme providers, suppliers, payment industry, media and lobbies. Specific focus should be paid to the final user’s needs (easiness, simplicity and fairness), public policy needs (shift in modal split reducing car travel, reduction of pollution, optimisation of operational efficiency, reduction of public expenses in budgets) and the transport operator’s needs (reduce operational costs of ticketing, improve fare collection efficiency).

It is also important to **recognise the trends** and act appropriately. The trends in ticketing can be specified as ‘from magnetic to contactless’, ‘from cash to smart payment’, ‘from in-house/on the field sales channels to externalised/remote ones’, ‘from mono-application to multi-application devices’, the ‘impact on infrastructure itself’ and the ‘impact on fare evasion’.

Smart Ticketing should have an impact on the way Public Transport is used. Using a ticket, or wallet, not only for transportation but for mobility services in general could improve the image of Public Transport. Access to fare information

and easier remote sales will also help the cause, whereas privacy concerns must be addressed in a code of conduct to be able to develop a trust relationship with customers.

The development of Smart Ticketing in a global urban ITS perspective has to be built in respect of local organisations and of the decentralised nature inherent to public transport and to the importance of its public funding.

The recommendations to deploy Smart Ticketing are therefore:

- **General:** Smart Ticketing should not be seen as a simple replacement for traditional paper or magnetic ticketing. An important step is identifying which features and functionalities of Smart Ticketing to be adopted and how they will integrate with the customers' wider mobility requirements.
- **Distribution channels:** Smart Ticketing must allow passengers to plan and book their travel through their choice of distribution and retail channels. This goal required a new system that can accommodate the speed, power and flexibility necessary to handle multiple distribution channels for ticket sales, including contactless payment and pre-loaded value.
- **Smart wallets:** Smart Ticketing covers not just pre-payment and the loading of a ticket onto the smartcard or phone, but can also include post-payment where the customer is identified on entering / leaving a closed system and verified that they are authorised to travel or have suitable payment mechanism available (whether that is a contactless bankcard or pre-arranged credit).
- **Business models:** Smart Ticketing is a global business and is, for the first time, being Standards led. This allows off-the-shelf technology to be adopted with only limited local tailoring to reflect specific tariff structures and cross-modal opportunities. By using open International Standards for Smart Ticketing, Public Transport Operators can access supply chains that are responsive, cheaper and address industry best practice.
- **Integration with travel information and traffic management:** By creating an EU Ticketing Portal and operating a Europe-wide compliance scheme, including liaison with compatible mobile phone and contactless bankcard schemes in Europe, Smart Ticketing can ensure the customer experience consistently meets their highest expectation.
- **Marketing issues / public support:** Urban ITS decision makers should now systematically look for integration in such wider organisations to take benefit from the mutualisation of standard technical tool boxes as well as to insert their customer offer in a wider market.
- **Organisational and legal issues:** Urban and national transport decision makers must actively support the development and implementation of European and international Specifications for Smart Ticketing to ensure mutual compatibility between all schemes.
- **Data privacy:** Protection of the customer's privacy is an ethical requirement of confidentiality, un-linkability, un-observability and

anonymity. A low level of protection not only could be punished as a violation of the law but would damage customer acceptance.

- **Interoperability and continuity of service:** Interoperability in transport Smart Ticketing implies removing the obstacles for the customer to switching transport modes. All ticketing needs for through journeys should be in one place and on their local transport Smart Ticketing media even outside their home network. There should be simple registration so the customer has a standardised machine interface and easy access in own language.
- **Development of Smart Ticketing standards:** The use of international and open standards can facilitate interoperability, the opening of global markets and compatibility between devices produced by different suppliers.

2. Introduction

Nowadays, there are a number of challenges lying ahead of the transport system. The idea of a Single European Transport Area, promoted by White Paper for Transport 2011, sets the goals to be achieved by 2050. The transportation has to become more competitive and resource efficient within this time horizon.

The **goals for urban transport**, in this respect, are to promote the use of cleaner cars and cleaner fuels. The need is also to reduce the number of fatalities. Yet another challenge is that the amount of traffic in Europe's urban areas has been increasing inexorably during last decades. The task of people involved in urban traffic management is to best allocate the scarce resources of road and kerbside space to potentially competing transport modes, within a network that has finite capacity.

Smart technologies and **Intelligent Transport Systems (ITS)**, in particular, have a role to play in achieving the aforementioned goals. ITS can significantly contribute to a cleaner, safer and more efficient transport system, especially in urban areas. The ITS Directive (2010/40/EU) gives the legal framework in order to accelerate the coordinated deployment of innovative transport technologies across Europe. It aims to establish interoperable and seamless ITS services while leaving Member States the freedom to decide which specific systems to invest in.

Two recent European Action Plans include complementary actions on the issue of ITS for urban areas:

- The **ITS Action Plan** (2008) foresees the set-up of a specific ITS collaboration platform to promote ITS initiatives in the area of urban mobility.
- The **Action Plan on Urban Mobility** (2009) foresees that the Commission will offer assistance on ITS applications for urban mobility, possibly in form of a guidance document, to complement the ITS Action Plan.

Resulting from these provisions, the **Expert Group "ITS for Urban areas"** has been set up in December 2010 for 24 months, in order to support the European Commission in its work concerning the aforementioned Action Plans. The Expert Group was multi-modal in its focus, broad in nature and covered the urban region taking into account the interfaces between the urban and inter-urban mobility. Both passenger and freight issues were considered and a dialogue between public and private stakeholders encouraged.

The tasks of the Expert Group have been three-fold: to provide guidance on ITS deployment in urban areas, collect best practices on successful deployment and identify a possible need of standardisation. The group had to develop specific **Guidelines** to promote and show the benefits of the use of ITS in urban areas along the individual travellers' mobility chain. The Guidelines despite the fact that they do not have mandatory character have the aim to foster interoperability and continuity of services within Europe.

The Guidelines target the organisations in charge of decision making and technical deployment of ITS on local level. For each **key application of urban ITS** a separate document has been issued:

- Traffic and Travel Information
- Smart Ticketing
- Traffic Management and Urban Logistics

3. Application concepts and context

3.1 Ticketing, a tool for fare management

A few years ago, the main objective of a ticketing system was firstly to organise the collection of public transport fares, while secondly to control and try to reduce fraud on the public transport network.

A first fundamental statement would be that a ticketing system (being smart or not) is only the tool that would permit the implementation of public transport fare policy at the level of the whole public transport network. Therefore, there is a need of an overarching authority and a clear code of conduct (in turn this authority could delegate power to sub stakeholders / consortium / operators depending on the tasks to be undertaken). The definition of fare policy is a real condition within the specification and the development of the associated ticketing system. Some of the main strategic issues needed to be addressed include the following:

- Do we want to collect payment before using Public Transport or could the user pay after the event in regards of the travel he will have done?
- What kind of fare policy (flat, zonal, axis or in regard of the distance) do we want to apply?
- Do we want to propose subscriptions contracts and social fares to specific users, and so the treatment of users' personal data? And should there be different pricing for peak, period or advance purchase
- Another strategic issue is: who is responsible for fare collection and redistribution + fare policy integration along the whole multimodal transport chain / network? Should there be alternative retail distribution channels?

One of the first recommendations to be given is that the public transport fare policy definition or clarification will be the first step of any Ticketing System project, and will condition the success of its implementation. This point, not covered in the present guidelines, needs to be considered by the policy and decision makers.

Furthermore, one of the key issues will, in some cases, be the possibility of having integrated multimodal transports fares, permitting final users to use different transport networks with the same ticket. The recent development of Smart Ticketing permits the interoperability of fares and ticketing.

With the arrival of Intelligent Transport Systems, the ticketing system has incorporated an important statistical function that permits its operator to better know the transport network usage by tracking its user (whilst respecting the privacy rights). This point is also important as it permits public transport operators / authorities to collect statistically significant amounts of data that will feed strategic analysis of decision makers. It will be important though to control the flow of data collected, in respect to amount and quality.

Moreover, the ticketing system, using new ITS technologies, and the ticket support used has also become a communication tool, driving the modern image of the public transport. Even if this point could be consider as secondary, it

needs to be integrated as it could be a crucial element within the evolution of the system itself and the encouragement of modal switching to public transport.

3.2 Smart Ticketing, a wallet for several tickets / services

For the last decade, we've been talking about Smart Ticketing ... but what is included in the term "smart" ticketing?

Before trying to define it, we need to remember that, when using the "smart" term, we're generally talking about new technologies and about integration of services not directly linked to the basic function, in this case of public transport ticketing.

The main issues of Smart Ticketing are therefore:

- Propose complementary services to users, in relation to their mobility (encouraging intermodality / multimodality and simplifying the use of public transport) or with a wider global multiservice approach (including services other than transport);
- Modify the relationship between the public transport user and his/her ticket but also the relation between the public transport operator and its tickets enhancing security of the processes and reducing fraud
- Improve the overall efficiency (and image) of the public transport network and the depth of data created during usage.

In conclusion, Smart Ticketing will permit to contribute to the overall improvement of the public transport network level of services, image, accessibility, with the main aim to facilitate and/or increase the use of public transport and so contribute to the overall political goal of developing a sustainable transport policy.

Smart Ticketing should be seen as a crucial mean that will benefit travellers within their mobility chain, and moreover within everyday life reducing the constraints / barriers of travelling with sustainable transports!

The starting point will be the fare policy to be applied or implemented, and it must be noted: **Smart Ticketing is NOT necessarily about having ONE ticket for your journey but having ONE wallet with SEVERAL tickets (which can easily be bought) and in the future possibly one wallet for several services.**

In the first case, Smart Ticketing and the application of Interoperability standards will facilitate the development of multimodal tickets permitting the usage of different transport modes with the same ticket. This will mainly rely on a political agreement and a complex decisional process, linked to the share of ticket sale revenues that have no direct relations with the technical solution applied / implemented.

The second case is an efficient way of breaking these barriers and permitting to offering the final users the possibility to acquire different tickets that will permit them to use a combination of trips and of services.

Smart Ticketing will therefore permit interoperability of contract (same ticket for a multimodal travel on a smart support system: e.g. card or mobile) as well as the interoperability of support (different tickets for a multimodal travel on the same smart support system: e.g. card or mobile).

One of the key opportunities of Smart Ticketing is the use of new technologies to simplify the way of using Public Transport and, more generally, of travelling.

This starts with the process of buying the ticket itself and of loading associated rights to get a better price for using transport. The mean and process of payment will therefore be addressed together. And finally it integrates the way of accessing / using transport modes, taking into account that simplicity will be directly linked to attractiveness and operations efficiency.

On this field, the use of new technologies will clearly permit the implementation of new models of using public transports. Here are some good examples of concrete applications that will be developed further in the next chapters:

- Use of smart technology to access Public Transport quicker (note it could also be an advantage from the PT operator's point of view, as it will specifically reduce the dwelling time and so increase the commercial speed),
- Use of Internet to manage a personal public transport account, associated rights and so buy tickets in order to prepare in advance travel and avoid losing time on vending machines (note this will also have a positive impact from the PT operator's point of view, as it should reduce the number of the selling points),
- Simplify the way of consuming public transport, using a pre-payment process or using an electronic wallet or bank account to directly access public transport (note this will also have a positive impact for the PT operator and its commercial organisation),
- Post-payment process and Pay-as-you-Go concept that will permit an automatic calculation of the best price for the final user, this solution is particularly appropriate when the Fare Policy is complex,

The last characteristic of a Smart Ticketing system will be its capacity and its level of integration with other services provided by entities other than the public transport operator. The first level will rely on the possibility "to use the same basket" to use different transport networks / tickets and so improve the intermodality conditions. A second level will rely on the proposal of other services, permitting the same support to use public transport and access to other services (City Card is a good example to illustrate this). But the most advanced level of integration will be when the ticket is completely virtualised and could be directly integration by other services (e.g. the possibility to take the metro with a Concert Ticket) or a non-dedicated support (like mobile phone or credit card).

Integrating back-office processes and support at a high level towards all services offered within a Smart Ticketing system will be very complex and must not be underestimated.

In conclusion, Smart Ticketing is a tool that is there to simplify final users the access to public transport and enhance sustainable mobility. It could also give a "smarter image" of public transports that will contribute to their attractiveness and efficiency.

But the tool itself is requires a clear vision of the fare management policy and of the "business model" a Public Transport Authority / Operator wants to commercially develop in the field of transport policy and strategy. Smart Ticketing can permit implementation more easily, but the stakeholders' partnership will be crucial to achieving the goal of improving the final users' travel facilities.

3.3 Application concepts

After having "conceptually" defined what Smart Ticketing is, there are a number of potential implementation choices within these guidelines, also taking into account how it applies to Urban Mobility.

- Smart Ticketing using a dedicated Application:
 - Smart Card will be on the top of the list, as it is probably the one which has now been developed the furthest in Europe. Note that it could, but need not to be contactless
 - USB Keys or Dongles are also means of support that are used on some networks, based on a contactless communication for the validation ;
 - More recently, the use of NFC applications (loaded onto mobile phones) has been developed and is considered as a promising solution for the future ;
- Smart Ticketing based on the virtualisation of Tickets:
 - It would use the concept of electronic tickets that could be printed with a security based barcode. Because a barcode can be copied easily, it is normally restricted to use for long distance trips involving a dedicated seat reservation;
- Smart Ticketing based on Secure Identity and Back Office Processing
 - Here the customer is identified on entering the transit system by means of the identity number of a smartcard, a government issued ID Card, contactless bankcard or secure tag. The customer either prearranges credit or a period pass / carnet to be associated with the Secure Identity, or the Identity is associated with a method of payment as is the case with a contactless bank or credit card.

There are two main issues that will be developed and explained in the coming chapters and that illustrate the difference between these three categories of Smart Ticketing:

1. In the first and second categories, the front-office process will be more developed; specific efforts will be necessary to ensure security, especially when working on the services integration.

2. In the third category, the main 'efforts' will have to be put on the back-office treatment and the relation with the final users in front office will be reduced as the support is not under the responsibility of the transport retailer.

Security (of transactions + security as perceived by users > need to trust the system) will be a key of success and requires the maximum attention, as the first goals of a ticketing system remain the funds collection and fraud control.

In the first two cases, as the ticket or at least the "transport application" will be material before the journey commences, the integration of services will be possible through / with the support itself. In the third case, the back office treatment will also be a key to success, as it will offer added-value services. However, the cost and complexity of the back office must be carefully considered so as to provide for value for money and long term sustainability of the Smart Ticketing solution.

The use of mobile phones could potentially offer many new and varied services (in relation with the transport itself - network or traffic information as an example - and with associated services). However, there are social / behaviour barriers that need to be addressed: some customers can be put off by the idea of using their mobile phone in order to access public transport, they could fear to be forced to put all the eggs in the same basket. The paradox that would need to be addressed is simplifying access, while offering more services and it is a real marketing approach that would need to be foreseen by cities that would develop such kind of application.

One of the main trends that could be extracted with the development of Smart Ticketing is that we are more and more personalising the "ticket", the contract used by the final user. The differing needs of groups or communities of people are becoming a challenge for the implementation of the Transport and the Fare Policies. In consequence, the concept of developing a personalised account for Mobility (not only public transport) is something that needs to be explored as it could probably be a lever for the behaviour change management in relation with the application of a sustainable mobility policy, including integration with journey planning, and traffic management solutions such as park-and-ride, bike hire, congestion pricing, etc. The use of Internet tools (including social networks) and information services, such as Journey Planning with integrated ticketing option, is a crucial issue that could encourage Smart Ticketing. This needs to be further explored as it could justify the investment necessary to develop Smart Ticketing technology at a network, national and cross-border level.

4. Stakes and public policy

4.1 Identification of stakeholders

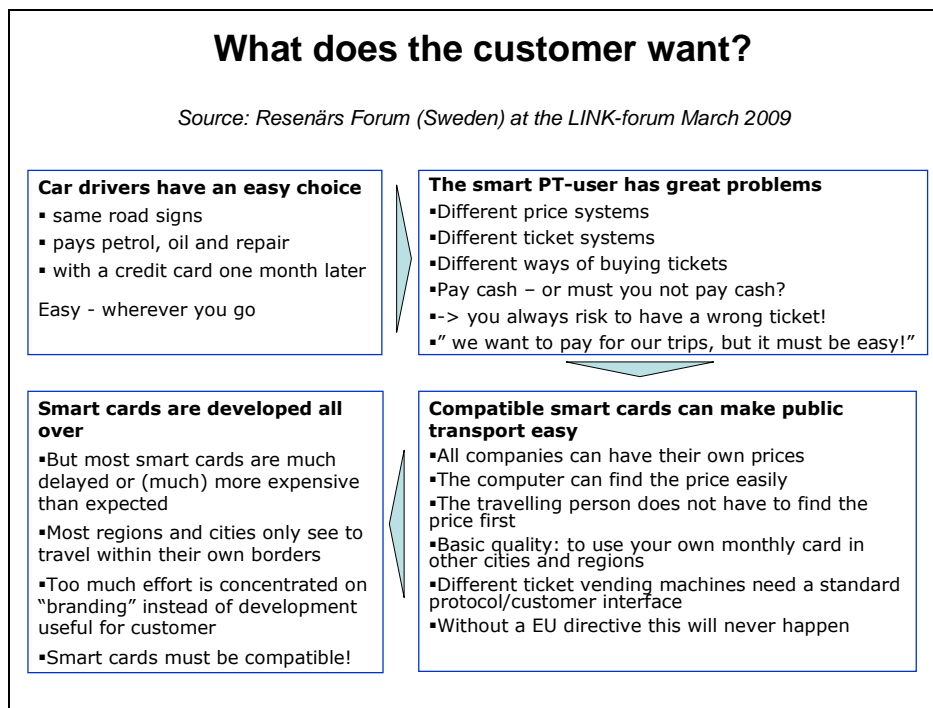
This chapter will permit to define who is considered to be part of the process within the development, introduction and use of a Smart Ticketing solution. There is a great diversity of stakeholders. Presently the stakeholders identified are:

- The clients
 - Clients have to be divided into different groups: permanent travellers, e.g. subscribers, occasional travellers and potential travellers.
- Politicians and authorities
 - Public transport authorities, authorities on local, regional and nationwide level, the European Union, national ministries of transport and economy, cartel authorities, data protection authorities
- Public transport operators
 - The public transport organisations themselves and their staff
- Scheme providers
 - The organisation(s) which is/are responsible for the application, the media, registrar, the secure element and the data-processing. The scheme provider is often owned by public transport operators and/or public transport authorities, but some roles are being adopted by other Trusted Service Providers (such as Mobile Network Operators).
- Suppliers
 - This group represents all necessary suppliers for EFM-Systems, such as hard- and software suppliers, smart ticket solution providers, consultants, service agencies and financial institutions.
- Payment industry
 - Banks, credit card companies and mobile phone operators are coming into the market with solutions for (contactless) payment. As such these solutions can be used for niches or even larger numbers of travellers in public transport.
- Media
 - All media including broadcaster (TV and radio), public press and specialist publications. Not to be underestimated: the internet and its forums, blogs and social media.
- Lobby
 - Lobbyists are groups or organisations with special interests, who attempt to influence decisions made by officials and/or organisations, such as public transport associations, passenger associations, automobile associations, tourist associations or associations for disabled people, the unions for public transport. + industries incl. telecom

4.2 Focus on the final user's needs

The final user of an EFM-system is the traveller who uses public transport. In these times of a "fast turning world" the traveller has a lot of needs, which can change from one day to another. Moreover, the group of travellers has a wide range of diversity in terms of use of PT, mobility patterns, habits, and technological media (smart phone, chipcard...).

Let's see how the passengers say it in their own words:



The main needs for the final user are easiness, simplicity and fairness (of tariffs). More specific this means:

- Easy media (chipcard, smart phone) handling is necessary. / ONE medium for all applications
- Simple electronic schedule journey planning including automated fare price determination / Real time travel information including alternative route suggestions
- Simple payment process / Convenient payment processes
- Same processes everywhere (intuitive handling)
- Guidance by one trademark and pictograms
- Simplification of tariff structures
- Travel related products (multi-application)
- Data protection / data security
- Growing mobility needs,
- Environmental protection

4.3 Focus on the public policy needs

Scope and scale of the public policy objectives vary due to the diverseness in local, regional and nationwide circumstances. Actual public policy issues are:

- Reduction in individual car travel; shift in modal split
- Reduction of pollution by using public transport, soft modes, clean vehicles or shared travel solutions, such as e.g. car-pooling (in the name of the rule "use" instead of "possess").
- Optimisation of operational efficiency
- Reduction of expenses in city budget for travel and optimising profit
- High importance of urban development planning in Europe requires sustainable urban transport planning

Smart Ticketing and all the potential that offers new technologies and associated services is now a key instrument that needs to be integrated in the toolbox of Transport policy makers. Indeed, this tool would symbolise and could concretely drive sustainable and durable changes in the mobility behaviour of travellers; not only in the way they will effectively travel but also on the way they will consume their mobility.

It is also important to enhance the link between long distance travel and “the first and last urban mile” such as rail, air or ferry so that passengers can include the journeys to and from their origin through to the final destination, in their ticketing.

Indeed, one of the key issue is to make easiest multimodal travels, and there are two options to organise ticketing for a cross network or multi-modal journey, or one crossing multiple borders:

- To offer the customer just one single ticket for the entire journey
- To offer separate tickets for each segment on a single support

The first offer with a single ticket is complex and costly to implement as it includes not only technical agreements but also business and political agreements. It obliges transport operators to circulate ticket prices for all segments. It is necessary to develop a common ticketing scheme, with common processes to fulfil and control tickets at gates or on board. The parties involved need to agree commissions to be paid for the lead retailer. There is settlement and clearing to be carried out. This option has only been feasible on limited urban or regional scales.

Smart Ticketing raises that inconvenience as it allows multiple tickets to be mitigated by loading them all onto a single device (“several tickets in one wallet”). The customer appears to have purchased a single through ticket, but one made up of multiple segments. There are thus no complex clearing and settlement rules to follow. This solution could also include long distance rail tickets. This scenario is however dependent also on the single smartcard being compatible with the technical standards of each participating transport scheme. At the same time, each transport operator must have the trust in the smartcard and its issuer, i.e. that the individual tickets are secure and cannot be altered or deleted until used.

4.4 Focus on the transport operator’s needs

From the point of view of the transport operator, the main issue would be to reduce the operational cost of ticketing, while improving the fare collection efficiency, while applying the fare policy defined by the transport authority.

Indeed, it is far too easy to invest substantial amounts of time, effort, and money in trendy new technologies that fail to improve the customer experience or deliver a satisfactory return on investment. In addition, transport operators must ensure that the Smart Ticketing systems they implement are adaptable, reliable and scalable, and can be adjusted over time to meet continually shifting demands.

Yet the opportunities inherent in Smart Ticketing are very real. Implemented correctly, such systems can revolutionize the ways in which customers use public transportation, adding significant amounts of convenience, efficiency and flexibility. These same technologies also have the potential to cut providers costs, grow their revenue, and boost their margins.

The key to success is integration and interoperability: Smart Ticketing systems must integrate their customers' preferred communication channels into a cohesive customer experience, and further integrate those channels and (new) services with the existing systems and processes that support the ticketing process and multimodal shift.

While such systems often require new technology, some organizations prefer taking advantage of the expertise and infrastructure resident in the managed services model.

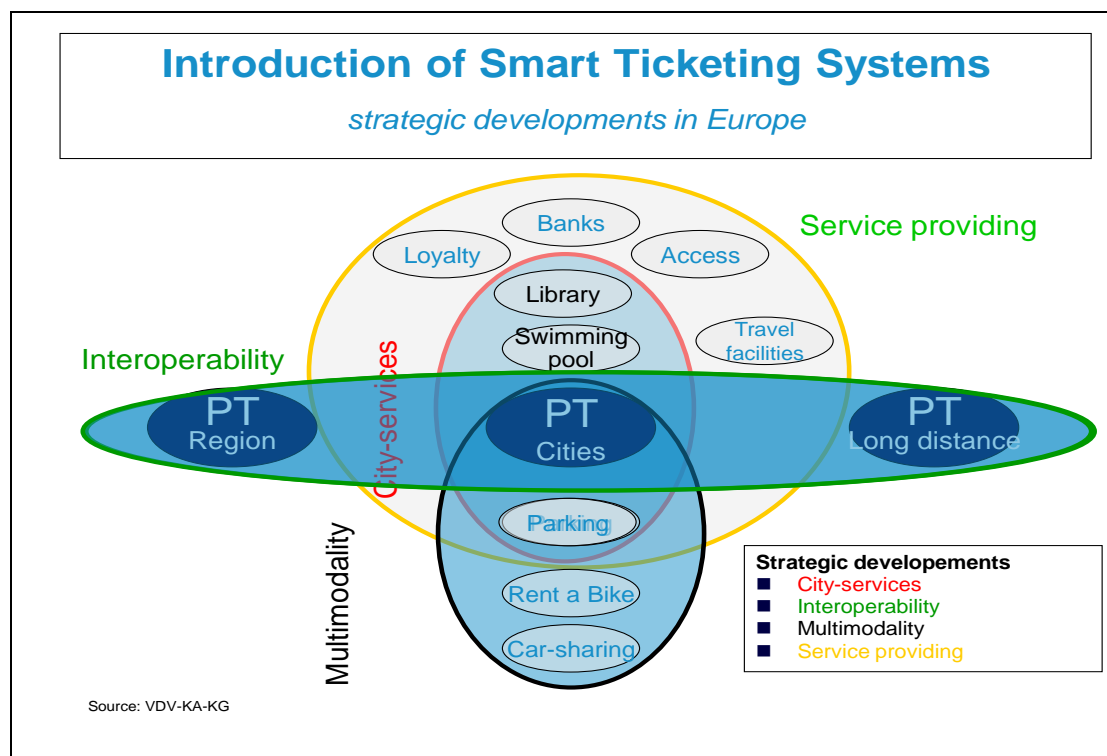
4.5 Conclusive remarks / summary

Summed up, in keeping up with rapid advances in Smart Ticketing technology in a cost-effective way, today's public transport operators can meet customers' needs for greater convenience while accelerating their pursuit of high performance.

The focus of the customers, operators and policymakers against the technological development in ticketing can be summarized as follows:

	<u>Operators</u>	<u>Customers</u>	<u>Government</u>
Mid 1990s – 2000s Transit Smartcards	<ul style="list-style-type: none"> ▶ Faster throughput ▶ MIS ▶ Fares Flexibility ▶ Non-transit apps ▶ Reliability 	<ul style="list-style-type: none"> ▶ Convenience of e-cash ▶ New Sales and payment options ▶ "It's modern" 	<ul style="list-style-type: none"> ▶ Non-transit apps ▶ Transit Integration ▶ Fares Flexibility ▶ MIS
Mid 2000s → Emerging Electronic Payments (Banks and NFC)	<ul style="list-style-type: none"> ▶ Multi-apps and sharing of costs ▶ Payment Flexibility 	<ul style="list-style-type: none"> ▶ Convenience ▶ Convergence ▶ Common payment 	<ul style="list-style-type: none"> ▶ Convergence ▶ Cost sharing ▶ Market appeal

Source: Mark Streeting



Source: VDV-Core Application

Multimodal and/or multifunctional Smart Ticketing can be very attractive for the final user; the organisational aspects of such schemes shouldn't however be underestimated. The number of stakeholders will increase and this means the need for a strong coordination.

Smart Ticketing needs to reside in a "Secure Element" (this can be a bankcard, a mobile phone or a USB-Key). The additional Roles and Use Cases for multi-application Smart Ticketing include the Secure Element Provider, its Issuer and Registrar, and the Trusted Service Manager that oversees the relationship with the customer and loads and deleted Applications securely.

5. Impacts of Smart Ticketing for different stakeholders

5.1 Trends in ticketing

From magnetic to contactless

Contactless Smart Ticketing first appeared in the early 90's as a technological evolution for systems that needed renewing. This has been the case for example for RATP, in Paris.

The technological change is mainly justified by the cheaper operational and maintenance costs of the contactless coding or reading devices.

The investment relates to different life cycles depending on the type of components:

- 15 to 20 years for vending machines, valuator or gates,
- 5 to 10 years for the software,
- 2 to 5 years for the cards.

From cash to smart payment

Cash management is a significant cost factor as well as a security risk.

Transport operators haven't been able to rely on bank cards to diminish the amount of cash, as it was necessary to serve unbanked customers, and because the commission to the bank was expensive for small amounts.

Stored value cards have therefore been developed as closed prepaid dematerialised systems

However, the secure management of stored value cards, very similar to electronic purses, is complex and expensive.

Customer accounts are now being developed as an alternative to *stored value cards*. They can be post-paid for registered customers and prepaid for anonymous customers. Their management in the back office is cheaper.

So long as the financial exposure is deemed acceptable by the transport operator, they don't require real time control at each entry point and can be settled at the end of the day with the identity blocked against further use in the event of payment not being received.

Stored value cards and *customer accounts* fundamentally remain closed systems. Interoperability can of course be organised by bilateral or multilateral agreements requiring dedicated clearing systems that can be complex and costly.

Translink (NL) is a good example of a single stored value system shared on a wide scale. VDV E-Ticket Germany agreement is an example of a set of interoperable regional stored values.

The use of bankcards for immediate payment at access points becomes an opportunity as the banks start issuing contactless cards and accepting small amounts transactions at low transaction costs for the merchant.

A complete convergence of the technical specifications yet remains to be achieved, and the certification processes of the payment chain may be a new cost factor.

From in-house/on the field sales channels to externalised/remote ones

Smart Ticketing opens to completely new organisation of the distribution channels.

Traditional in house channels based on ticket offices and automatic vending machines can be completed with the use of other existing channels.

Dual interface contact and contactless cards can for example be reloaded in bank cash machines. Such a possibility has been developed for example in Lisbon.

Remote selling Over The Internet (OTI) can also be developed using USB or contactless interface devices between personal computers and cards or for USB NFC keys or dongles.

These new channels are cheaper to operate than the traditional ones. Their introduction will however create new development and operational costs (as well as potential privacy issues) that will only be returned if other channels really diminish or disappear.

From mono-application to multi-application devices

The use of microprocessor cards is now largely accepted as necessary for security and privacy reasons. From the start, it has been the option of large systems designed for a wide interoperability, such as Calypso, ITSO or VDV-KA. Most systems have now built migration plans in that direction. The extra cost of micro-processor cards now appears to be a second order criterion.

The co-issuance of cards with other businesses has been experienced (TfL and Barclays bank) but could only remain local. In some case, when such an arrangement happens, the costs of emission of card and the costs linked to the security of the card are externalized from the transport operator, and this could be an important factor in order to reduce the operational costs.

The development of flexible multi-application devices into which different transport or non-transport applications can be downloaded opens also to new business cases, among which the use of NFC phones is the dominant case.

Impact on the infrastructure itself

As already mentioned, the ticketing system includes the access control process, which is mainly defined by two aspects: gated/not-gated networks and check-in/check-in-&-out fare systems.

More than 40 to 50 persons per minute can validate on the same contactless device, which is approximately 25% more than with magnetic tickets.

This can be a major advantage where the entry or boarding process is critical such as saturated bus lanes, tram lines or underground stations. It is also a factor of economy when designing new stations.

Impact on fare evasion

Should the ticket be or not be smart has of course no influence on people who choose to fraud by travelling without any ticket. Inspection at gates and in the network itself has to remain efficient.

Advanced technology is developed to prevent false tickets to be issued or real tickets to be falsified.

Standardised algorithms and processes provide good solutions. Differed controls in the back-office however remain necessary to make sure that no undue operations are processed.

Post-paid systems also bring the risk of unpaid trips, which can easily be mitigated by the use of black lists activated from the first alert.

Each scheme must decide a security policy balancing the risk analysis and the cost of the preventive counter-measures.

5.2 Impacts on traveller behaviour / way of using PT

Contemporary image of public transport

The very numerous applications all over the world show the unanimous acceptance of contactless ticketing, with easy usage and fast access being the main advantages.

To take the best benefit from that and improve the ridership by bringing more citizens to choose public transport, the ticketing systems should however open to new services and meet the general evolution towards ITS: more services, easier access to information, easier payment.

The development of multi-application media, among which NFC mobile phones will stand, is an excellent opportunity for Public Transport to be considered by the citizens as THE major service among the set of urban services,

More services: from local transport network to mobility services

From the customer point of view, interoperability is not a technical issue but a window opened to a wider universe: not only here, but elsewhere, not only traditional modes but also soft modes, not only transport but also parking, etc.

The argument that only 3% of urban transport customers continue their trip on other modes should not be a reason to neglect the needs of this customer segment but on the opposite should be a reason to try and develop it.

Easy access to fare information

There is a need to address customers occasionally coming to an urban network with Smart Ticketing.

The development of interoperable media will be a more economic solution than the issuance of local smartcards for just a few trips. This can be done by steps, as demonstrated within the 7th Framework Programme research project IFM (Interoperable Fare Management).

As customers more and more frequently use travel planners, but still have difficulties in finding precise information about fares for their urban last miles, urban networks can take advantage to encourage long distance travel planning websites to propose a link to their local websites and provide fare information in the most frequent languages.

Easier remote sales

Internet merchants are fast developing in all domains. In France more than 30 millions of customers, 50% of the population, buy from the web, (3rd trim. 2011) and the proportion grew by 12% in one year.

There is a strong expectation by customers for the development of this type of sales channel by urban transport networks to avoid queuing at distribution points or vending machines, especially at peak times.

Privacy

Customers remain concerned about privacy, especially in the field of their mobility. Proposals have been made by the IFM project for a code of conduct, and urban networks should communicate about their action in that field to develop a trust relation with their customers.

5.3 Impacts on public transport organisation

Smart Ticketing changes the organisation of commercial, marketing and retailing resources and created a need for information system and distribution channel management. Operational management also gets valuable information from the validation points on the traffic.

Towards shared resources and common governance

In the 90's, most urban ticketing applications started as independent applications. Transport authorities and operators were at the same time responsible for the definition and the distribution of their application and of the fare products, and for all customer services, even if some of these functions were subcontracted.

Different forms of mutualisation progressively appeared:

Technical organisations appeared such as Calypso (EU), VDV-Core Application (D), Translink (NL), ITSO (UK)

Commercial organisations also appeared, jointly or not: VDV created E-ticket Germany jointly with VDV-Core Application; Translink manages a national kilometric fare product for occasional trips; ITSO supported the national concession and train franchising programme, BMC supports the Belgian interoperability and uses Calypso specifications, France recently decided to create a common application for occasional trip.

Calypso Networks Association offers all Calypso networks the possibility of a complementary application TRIANGLE that allows commercial interoperability across their borders.

ISO/IEC 24014-1 standard provides a model of the roles to be fulfilled to monitor and operate such fare management systems where many stakeholders can participate.

Part 3 of the same standard – a technical report to be approved April 2012 – extends this model to the management of different applications in multi-application devices such as Java cards and mobile phones.(see *fig. below*)

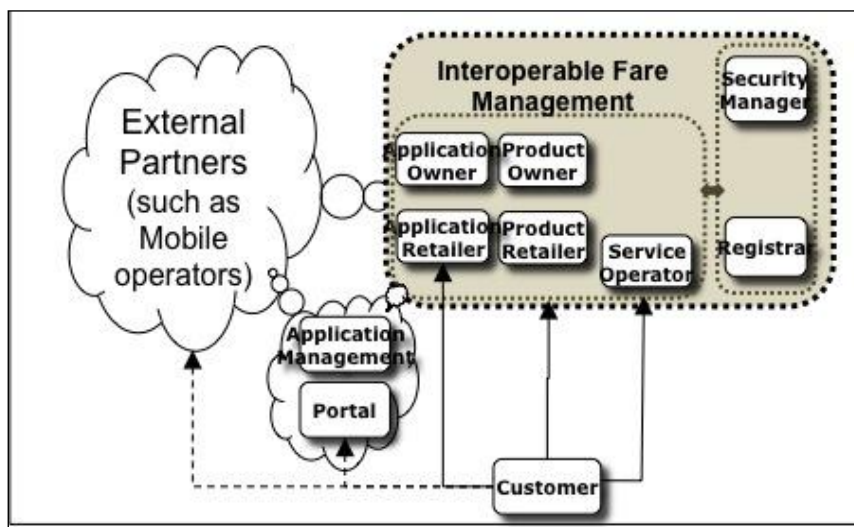
This functional model doesn't determine how the roles are split between organisations¹.

The business organisation remains dependant of each implementation. Some Smart Ticketing schemes are simply the "permission to travel" whilst others may include interoperable products that involve distribution, retailing and settlement. In these cases the governance of the systems may vary from case to case depending on the risks and complexity involved.

All Smart Ticketing schemes will need to analyse their organisation referring to

¹ Organisations can be transport authorities, transport operators, groupings of these or sub-contractors

the model and clarify their governance in order to develop interoperability and agree common processes with external partners such as the mobile phone operators.



Role model (Extract from ISO 24014-3)

In the above figure, the roles inside the interoperable Smart Ticketing scheme (grey area) has agreed with external partners such as mobile phone operators or other organisations to use their multi-application resources.

The roles to manage the applications must be defined, as well as the portals from which the customer can access the applications.

New business models

The business model with multi-application has not yet been completely defined.

It requires a common understanding of what are the different B2C, B2B and even B2B2C relations, not only to comply with the European competition regulations but also to help the decision makers identifying where public funding is given.

In the particular case of mobile ticketing, ticket sales for example is a Transport to customer service, the use of the telephone is a Mobile Operator to Customer service, and the possible billing of the transport service via the telephone bill is a B2B2C service.

5.4 Conclusive remarks / summary

The sales and access control processes are first to be considered as cost factors, requiring investments and high operational costs. Distribution costs may reach more than 15% in complex kilometric fare systems such as regional railways.

The traditional manual punching of tickets used to require many operators. As shown above, in the description of trend in ticketing, since the 1980-ties, these processes have been progressively automated with automatic vending machines, bank card acceptance and magnetic validation of tickets. Simultaneously, more efficient accounting systems have been developed.

It is important to underline that the benefit of rolling out of Smart Ticketing system is therefore very different depending on the state of development of the existing ticketing system.

Generally speaking, a Smart Ticketing system will be more efficient, but no economies will really be realised if the previous ticketing systems remain in parallel. A complete step by step migration strategy must therefore be built for an optimal benefit.

a) Policy implications

The development of Smart Ticketing in a global urban ITS perspective has to be built in respect of local organisations and of the decentralised nature inherent to public transport and to the importance of its public funding.

The responsibility for fare products should therefore remain local and the acceptance of common fare policy be left to bilateral or multi-lateral agreements. All existing examples follow this rule.

An important benefit can be expected from technical convergence and from common references to specification and certification processes.

The insertion of transport ITS with other businesses, mainly banks and mobile network operators, will gain in efficiency if common business organisations get the authority to represent public transport requirements.

b) Benefits

As mentioned previously, the potential main benefits will be obtained in the next fields:

- improvement of the level of services proposed to the travellers, with the possibility to implement fare policy , while optimising the service offered to the traveller;
- possibility to create a user account for mobility and transport and the potential offered in order to personalise services offered to users;
- reduction of operational costs by using new type of payment process;
- improvement of the image driven by the new services and associated supports / tools used;
- increase the level of accessibility and the efficiency to the transport means.

c) Issues / weaknesses to overcome

Smart Ticketing is only a tool. If one couldn't say what is the main goal or the objective behind developing it, especially in term of policy fare (multimodal or multiservice), the first consequence could be the feeling to have develop complex tool, that could in certain cases not cover easily some needs.

Moreover, the way to define a multimodal fare is always a very complex process (e.g. define a daily ticket for young people will consist to define the exact duration when the ticket should be valid and what is a young people, under 25 or under 24) that would generally need a quite long period of negotiation and of harmonisation of policy fare of different stakeholders. Its concrete implementation will so rely on the capacity of the different ticketing systems concerned to treat it; it's the reason why simplification and standardisation are keywords in the overall decision makers' process.

Furthermore, one of the most important negative feedback which is generally stated with such a solution is the fact that treatment of groups is harder to manage. Indeed, such kind of solution relies on an individual / personalised treatment that prevents from developing interesting solutions for group of users / travellers. Some technological solution could be developed, but there will be quite complex to set up and could introduce some regression on the overall solution.

Another weakness, that mainly concern smart cards, is the fact that the final users could not know easily what are the contracts downloaded on the cards and/or the date of validity of some rights. However, with the development of personal account and the integration of new technology, this barrier could now be overcome.

Finally, one of the important point that also need to be integrated, is a usual fact that concerns all Intelligent Transport Systems, and the consequence on the technical skill level that need to be increased for the maintenance and operational staff. This represents also a cost that need to be integrated in the overall cost of such kind of project, either if now, new and innovative

organisational models are developed in order to assume the exploitation of the whole system.

6. Recommendations to deploy Smart Ticketing successfully

6.1 Introduction

Launching a Smart Ticketing capability can be a complex undertaking for a Public Transport Authority or Operator. It is critical that the options chosen meet their requirements and work towards integration at the local, national and cross-border level.

It requires transportation providers to build new systems and infrastructure, train staff and use public funds as sparingly as possible while providing satisfactory returns on investment. All this will be accompanied by keeping customers happy while educating them in new ways for planning their journey, buying their tickets and managing their journey.

Smart Ticketing should not be seen as a simple replacement for traditional paper or magnetic ticketing. An important step is identifying which features and functionalities of Smart Ticketing to be adopted and how they will integrate with the customers' wider mobility requirements.

For a Smart Ticketing platform to add value for several years, and thus justify its initial investment, typically has several key attributes.

6.2 Distribution channels

Smart Ticketing must allow passengers to plan and book their travel through their choice of distribution and retail channels. This goal required a new system that can accommodate the speed, power and flexibility necessary to handle multiple distribution channels for ticket sales, including contactless payment and pre-loaded value.

These channels include mobile services, which allow passengers to book travel on the go without having to pre-register, downloading a mobile application to a Near-Field Communications (NFC) enabled phone as well as mobile websites, and traditional PC-accessed sites.

The adopted Smart Ticketing solution must support the entire customer service process, from journey planner, ticket ordering through sales and customer service to customer billing and accounting.

Once the passenger has requested tickets, these channels must coordinate and be interoperable with all existing transport operators ticketing systems to conform or complement their availability and pricing.

The system should be able to manage a wide range of ticket types, zones, and rates, including single-ride and multi-ride tickets with either immediate or triggered validity, as well as period passes (weekly, monthly, weekend, tourist, etc.), pay-as-you-go and multi-operator transit.

Regardless of the complexity or simplicity of the passenger's request, the Smart Ticketing system must quickly and accurately calculate a price that is aligned with the transportation provider's itinerary zone and tariff system or provide the customer with a post event billing service that is accurate and timely.

The system also must allow passengers to pay for their tickets in the most convenient way possible, including for example contact or contactless credit/debit cards, via premium SMS, pre-paid wallet, direct debit, personal or employee invoices, etc...

6.3 Smart wallets

Once the Smart Ticketing system secures payment, it should be able to deliver the ticket or authority to enter the transit system and travel in a wide variety of ways. The customer should be able to choose whether they wish to pay with a purse or use a pre-purchased ticket. They do this by selecting the wallet (or wallets) they wish to use. This can hold their Identity, purse or tickets for their chosen journey; this can include Identity Cards / tags, Smart Cards and contactless Bank Cards, and NFC-enabled mobile phones.

Smart Ticketing covers not just pre-payment and the loading of a ticket onto the smartcard or phone, but can also include post-payment where the customer is identified on entering / leaving a closed system and verified that they are authorised to travel or have suitable payment mechanism available (whether that is a contactless bankcard or pre-arranged credit).

Smart Ticketing also embraces Mobile Tickets: alphanumeric codes (including conventional and 2-D barcodes) that are visually inspected or read by barcodes scanners or NFC-devices.

As with any system that will be used by large volumes of people on a daily basis, fraud and theft must be addressed whilst respecting the privacy of the customer. These features require a robust yet flexible technology platform capable of interfacing to a range of Smart Ticketing media and supporting applications and services that use a common set of interfaces which, in turn, allows new functionalities to be developed rapidly and cost-effectively. These features address not only the over-the-air communications with the Smart Ticket, but the security algorithms used, file structures for data, as well as the data itself.

It also should feature built-in business and technical administration systems to monitor and manage capacity and performance continually, and connect with in-house business support systems such as billing, CRM, ERP, and travel planning systems.

Such connectivity enables urban decision makers and transport operators to provide fast and seamless customer service, attain a holistic view of customers' purchase behaviours, mobility requirements and service usage; and to use that information to improve billing and customer relationship management processes, and make better decisions regarding mode of travel, routes, schedules, fleets and fares.

6.4 Business models for Smart Ticketing

Existing Public Transport business models are limited, both geographically and modally. Public investments capacity is limited and public concern must be addressed as to why the public sector should lead the introduction of Smart Ticketing services whilst encouraging modal switching to lower carbon transport.

Smart Ticketing is a global business and is, for the first time, being Standards led. This allows off-the-shelf technology to be adopted with only limited local tailoring to reflect specific tariff structures and cross-modal opportunities.

Suppliers are becoming multi-national and one way transportation providers can minimize the costs of such a system is by taking advantage of the trusted service manager, in which a third party provides all the capabilities necessary to operate Smart Ticketing effectively — including the technology platform, business processes and people.

In addition to examining the need to invest in in-house infrastructure and capabilities, this model gives transportation providers the opportunity to link the amount that they spend to use a Smart Ticketing platform to the number of physical tickets they issue and the volume of passengers they support, thus eliminating the risk of paying for unneeded infrastructure and overhead.

A managed services arrangement can also provide flexibility, enabling a transportation provider to cost-effectively scale its Smart Ticketing operations as demand grows.

With these capabilities in place, transportation providers could be on their way to providing a Smart Ticketing service that coordinates and connects passengers, payment issues, technology, security, and Public Transport Operators across a multi-step process.

By using open International Standards for Smart Ticketing, Public Transport Operators can access supply chains that are responsive, cheaper and address industry best practice.

6.5 Integration with travel information and traffic management

Smart Ticketing is just one step in the Customer Travel Experience. From the initial Journey Planning through Fare Selection it must be possible for the customer to seamlessly access Smart Ticketing through their preferred distribution channel, using the identity, purse or tickets in their preferred wallet. This experience continues during the journey with access to timely Real Time Information for the customer and Traffic Management for the Operator.

By creating an EU Ticketing Portal and operating a Europe-wide compliance scheme, including liaison with compatible mobile phone and contactless bankcard schemes in Europe, Smart Ticketing can ensure the customer experience consistently meets their highest expectation.

6.6 Marketing issues / public support

For customers to understand the Smart Ticketing offer, the Public Transport industry must develop a consistent message in simple language that stresses the interoperability benefits, (the opportunity to adopt a lower carbon mobility profile with the consistent customer interface) and the removal of barriers, particularly relating to payment.

Urban ITS decision makers should now systematically look for integration in such wider organisations to take benefit from the mutualisation of standard technical tool boxes as well as to insert their customer offer in a wider market.

New marketing platforms will be opened by Smart Ticketing and customer expectations must be managed.

Public Support through open customer engagement is essential for trust in the new technologies to be consistently delivered. Urban Decision Makers will have a significant role in developing marketing and modal integration strategies and the business processes in managing customers experience across modes and across borders.

A number of organisations in Germany (VdV KA), UK (ITSO), Netherlands (TLS) and France (AFIMB and Calypso) have shown within the research project IFM (7th Framework Programme, 2009-2010) that their individual Smart Ticketing solutions can co-reside on a single smartcard. There is strong support from the European Mobile Network Operators for such a solution and it parallels developments in the Single European Payments Area for contactless payment in a multi-application environment.

6.7 Organisational and legal issues

For Smart Ticketing to operate seamlessly across Europe there must be cooperation between urban and national transport providers, between public (national, regional and local) and private sector operators and suppliers, between journey planners and between retail and distribution channels.

For this to effectively operate across Europe, the Smart Ticketing schemes need to cooperate, build consensus, share best practice and speak convincingly and with one voice to the legislature, to other industry bodies and to customers at large. This can only happen through the development and agreement on relevant standards and relationships, ways to verify compliance and provide all stakeholders with trust in the technology and systems used in Smart Ticketing.

Urban and national transport decision makers must actively support the development and implementation of European and international Specifications for Smart Ticketing to ensure mutual compatibility between all schemes.

It should however be noted that Smart Ticketing does NOT imply clearance and settlement between Operators. The relationship may include interoperable schemes which have settlement, but this is a commercial decision between operators (or has been mandated by Local Authorities). The prime relationship in Smart Ticketing is with the media or wallet owner and the Trusted Service Manager who collectively manages the loading (and cancellation / deletion) of all the applications loaded within the wallet. This is typically the original smartcard issuer or the Mobile Network Operator in the case of an NFC-enabled phone.

6.8 Data privacy

Collection of travel data can be challenging; the customer data stored in the system and in the customer medium are used for the benefit of customers to process payments, deliver entitlements and for a more user friendly interface. They are also used to mitigate the risks of misuse, manipulation or passing-on of the media to unauthorised persons that could incur commercial damage to the service operators.

Protection of the customer's privacy is an ethical requirement of confidentiality, un-linkability, un-observability and anonymity. A low level of protection not only could be punished as a violation of the law but would damage customer acceptance.

Smartcard Privacy must defend the following principles:

- Anonymous accessibility
- Protection against risks of abusive use of personal data from applications in the media
- Protection against risks of abusive use of personal data by staff
- Protection against risks of abusive usage of abnormal events
- Protection against risk of abuse of direct marketing tools
- Protection against risks of hacking and criminal use of personal data in back-offices
- Protection against risks of uncontrolled dissemination of identity data

6.9 Interoperability and continuity of service

For the customer to feel Smart Ticketing technology is bringing material improvement to the journey experience and encourage modal switching to lower carbon modes, interoperability between schemes is essential. Smart Ticketing media issued to the customer by one transport operator should be compatible with other Public Transport in region, with other regions and with interurban/international systems.

Interoperability in transport Smart Ticketing implies removing the obstacles for the customer to switching transport modes. All ticketing needs for through journeys should be in one place and on their local transport Smart Ticketing media even outside their home network. There should be simple registration so the customer has a standardised machine interface and easy access in own language.

Currently there are a number of steps needed to reach full Europe-wide Interoperability through mutual agreements between individual schemes to accept each other's Smart Tickets:

Step 0: Look at your closet neighbours and identify the potential level of interoperability and technical compatibility between their own solutions and your own Smart Ticketing project.

Step 1: Smartcards are issued to common EU Smartcard Ticketing Specifications with Schemes join a Ticketing Alliance Trust Scheme. Customers can then download the Smart Ticketing Applications they need.

Step 2: Common Ticketing Applications are defined that allow the customer to download the Smart Ticketing Applications they require to their mobile phones or their smartcard.

Step 3: Provide a common web / mobile portal that allows access to a range of national and local Smart Ticketing applications and encourage common cross-border products.

6.10 Development of Smart Ticketing standards

The use of international and open standards can facilitate interoperability, the opening of global markets and compatibility between devices produced by different suppliers.

There are already Open International Standards covering each of the main interfaces and Use Cases for smartcards in Public Transport to ensure their interoperability at the card, application and data level. There are also examples (listed below) of specific Standards covering the physical and logical security aspects of their use.

RF Communications	ISO 14443
Data Commands	Global Platform /ETSI/GSMA
Operating Systems	Java / Android etc
Filing Structure in card	ISO 7816
Security Algorithms	Global Platform (3DES, AES, RSA etc)
Card physical and logical security	Common Criteria
Smart Ticketing Roles and Use Cases	ISO 24014 (IFM)
Transport Application Design	EN 15320
Transport Data	EN1545

Further European standards are being developed for the specific transport requirements of NFC mobile phones, and for the Messages sent between individual Smart Ticketing systems as well as with Mobile Network Operators. This way mobile phones, ticket machines, gates and valutors can communicate with their back offices. This will include the secure handling of data between operators whilst at all times respecting commercial confidentiality and customer privacy.

7. Further information and contacts

7.1 Best practices collected within the work of the Urban ITS Expert Group

Nr.	Project name	Country
3	Lyon-Global Urban Ticketing	FR
6	Trondheim-Smart Ticketing	NO
7	Paris-PassAutocar	FR
15	London-Oyster Card	UK
23	NL-Public Transport Chipcard (OV-Chipkaart)	NL
26	NL-Yellowbrick-Parkline	NL
27	CH-Easy Ride	CH
28	CH-Mobile Ticket	CH
31	Toulouse-Electronic Ticketing System	FR
33	"Paris"	FR
34	"Lyon"	FR
38	CRTM / Madrid Region: Contactless card end of 2011- integration of high number of operators	ES
40	STIF: Navigo card: multimodal contactless chip card enabling user to travel on the whole public transport network of Ile-de-France whatever the operator	FR
41	MOVIA / Copenhagen: Sms Ticketing: Single ticket and multi trip tickets for the entire public transport network of Greater Copenhagen	DK
47	ATM / Barcelona: Significant steps have been taken towards the e-ticketing. The project is totally based in existing ISO/EN standards, open interfaces, multi services-oriented support, etc.	ES
57	Deutsche Bahn: Touch & Travel (NFC Pilot)	DE
62	Helsinki: Increasing Public Transport Ridership through Smart Cards and Mobile Ticketing	FI
63	La Rochelle: Optimising Multimodality through Integrated Ticketing: yélo	FR
68	Turin: Contactless Smartcard for Seamless Mobility	IT
86	Handy Ticket KVV	DE
93	VVS-HandyTicket	DE
98	Bremen: eTicketing / BOB Card	DE
99	La Rochelle: The Electronic Ticketing system in La Rochelle and beyond in Charente-Maritime county	FR
100	RATB travel card – a solution for your time. Increase the public transport attractiveness, by making use of contactless card technology	RU

7.2 Contact information

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