



REMAINING CHALLENGES FOR EU-WIDE INTEGRATED TICKETING AND PAYMENT SYSTEMS

Annex I

GRIMALDI | STUDIO
LEGALE


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Project analysis (output for Task 1)

All ways travelling (April 2013 – January 2016)¹

1. To what extent it became easier to passengers to travel with multimodal transport?

Multimodal Information Ticketing Systems (MMITS) will have significant socio-economic benefits over time, and thereby improve the quality of life for European citizens.

The study has been able to identify environmental benefits of between 650 and 2,834 million Euros per annum driven by modal shift to more environmentally friendly modes.

A well-functioning MMITS market will have further positive impacts:

- Stimulating demand for multimodal travel options
- Increasing accessibility to and use of metropolitan public transport systems
- Opening business opportunities for SMEs and new entrants into the market
- Fostering technological innovations
- Accelerating the development of solutions for interconnectivity between transport modes, e.g. at airport and railway stations
- Increasing attention to and requirements for selecting more environment-friendly journey options
- Improving accessibility to transport information and transport options for citizens with reduced mobility or other disabilities
- Stimulating fair competition between MMITS providers and between transport providers due to the improved and unbiased access to information

2. To what extent did the project improve fare data access?

Under ideal circumstances, a passenger should be able to plan and book a trip across Europe using different transport modes as easily as making a common domestic journey using only one transport mode. One-click search, one-click booking, and one-click payment and travel entitlement issuance. To reach this goal, at least three problems have to be solved:

1. A transport information system has to be developed on a European basis that provides accurate data for trips throughout Europe. This implies the integration of schedule, availability and fare information for air, rail, ferry, long distance bus and local transport services.
2. Easy access to online booking, payment and ticketing services.
3. Physical integration and connectivity between transport modes must be improved to facilitate passenger flows and establishment of seamless journey combinations.

3. How relevant is the intervention to passengers?

By providing one single point of information and ticketing access in the language of choice, complexity can be reduced for the consumers, and add visibility of better travel options than currently available today. Different ticket-vending machines, price categories are frustrating even for experienced travellers.

4. How likely are the effects/results of the project last after the project ends?

The establishment of a well-functioning marketplace for Multimodal Information Ticketing Systems (MMITS) will significantly contribute to achieving the ambitions of the *White Paper on Transport*. Comprehensive and unbiased MMITS that provide location-independent search, booking, payment, and trip entitlement issuance, are highly likely to be attractive for users, in turn providing and attractive marketing and sales channels for travel providers.

The modal shift facilitated by MMITS will lead to further, positive effects, with estimated costs saving of around 13 billion EUR per year. Especially public transport can benefit from joining

¹ <http://www.allwaystravelling.eu/home.aspx>

MMITS by creating and making available completely new travel options to existing and new users.

5. What are the lessons of your project that can be useful for this study:

9 Barriers and how to overcome them

10 Solutions

There are no technical show-stoppers to achieving interoperability between travel provider systems through an architecture that enables MMITS solutions, although, clearly, there are specific technological challenges.

Recommendations for the European Commission:

- Increase support to industry initiatives, while in parallel establish a credible regulatory alternative should the market fail to deliver desired results.
- Ensure that access to schedule, fares and availability information is available to all players in the market for multimodal travelling on a non-discriminatory basis, based on agreements that govern access to and use of information that can be deemed sensitive.
- Any regulatory intervention must distinguish between carriers subject to free competition and public transport operators working under public service contracts. Carriers in free competition should under normal circumstances not be subject to mandatory third party retailing.
- There should be no EC regulation regarding a specific technological solution for non-discriminatory information provision.
- Passenger rights and conditions of carriage have to be defined for multimodal trips.
- Clear interfaces have to be defined and a regulatory framework has to be set to stimulate local public transport operators' participation in MMITS without advantages.
- The competitive behaviour of transport operators participating in and/or controlling a MMITS has to be supervised strictly, and the introduction of a "code of conduct" should be considered.

Information provision/Access to Data

Comprehensive information is essential for the success of MMITS in the EU, and a common ecosystem might offer the best solution to making information interchangeable. This can be realised via a number of platforms, accessing multilateral MMITS interfaces as an extension of each transport operator's existing web services.

The provision of information needs to address concerns of accuracy and commercial sensitivity, especially for commercial operators. This requires solutions that do not only rely on static data but also on API-based requests, at least for pricing and availability. The access to data must be subject to terms and conditions of use in order to avoid any undesirable exploitation by the participants in the ecosystem.

While a MMITS is intended to be a single contact point for booking door-to-door journeys, carriers should not necessarily be obliged to accept any MMITS-provider as retail agents, because retail is based on bilateral contracts. Nevertheless, all relevant European transport operators will have to share their information with other players in the market in order for an MMITS marketplace to work.

Industry collaboration and/or Regulatory Intervention

If industry stakeholders, on a voluntary basis, develop their market solutions in line with political objectives and the rule of law, no additional governmental intervention is required. When collaboration is faced with barriers or limitations, government may incentivise and support and/or regulate or force industry stakeholders to achieve political objectives or ambitions.

BMC (ongoing project)

As ticketing operator in Belgium, BMC tries to provide seamless ticketing for **commuters**. One important distinction must be done. For long distance, occasional, cross border travels, there are a lot of good solutions exist. Short distance commuting is more challenging.

Geographical scope:

- North of France and Hainault in Belgium
- Grand/Grob Region: France, Belgium and Germany around Luxembourg
- Euregio Maas-Rijn

The Belgian ticketing system is card-based. If on both sides of the border, the cards are from the same technology, it is possible to have a card integration. Also, the cards may be of different standards. There are mainly 3 standards in smartcards public transport: Mifare, NXP and Calypso. If the standards are different, cards are not compatible.

BMC, as common authority, develops, maintains and operates the Central System

Working groups:

- **Commercial Group**. The group discusses all common commercial aspects. It also synchronises the way to promote the system and the services. This includes the openness to new services and new partners.
- **Technical specifications group**. Each time a change is done in one or another country, it must be verified against the specifications.
- **Financial group**. The group will deal with all aspects of accounting between the different actors in the cross-border project.
- **Incident Management & Change Management group**. The group will identify, follows and find solutions to possible incidents. Only the inter-operator incidents will be managed by this group.
- **Security and Privacy group**. Due to interconnection, a security breach in one system may have impact also on others.
- **Legal Group**. Agreement between companies are contracts. They must be discussed by legal departments of different actors.

What are the lessons of your project that can be useful for this study:

Challenges

The first big challenge is price integration. If you live in one country and work in another, you will nearly always have to pay for (at least two) different passes. Therefore, the commuter will pay twice the price. One where he/she lives and other where he/she works. In many cases, a cross-border travel will cost more than a national one, even if the travel is shorter.

Belgium is divided in 3 regions. There are four Ministers of Mobility and four operators. The common aspect in Belgium is the commuting card. Around Brussels, you can be in a situation where in 10 km, you have to pay 3 passes. The main problem is not the total price but the split of the total price. The way to solve this problem is to have an "supra"-national authority that deals with cross-border price integration. This authority must be also in charge of redistributing revenues according to service provided.

The second challenge is related to governance and day to day operation. Based on the Belgian experience, there is a need for a communications system and for different working group.

The communication system maintains certain info in a central database:

- Technical information about valid cards that can be used for different services. This includes the functionality of transferring the information that a card is stopped because it has been stolen or lost, or the information that a card has been replaced by another.
- Information about consumption of services provided by A and paid to B. The communication system will generate appropriate invoices between A and B.

The European Travellers Club (ETC) (ongoing project)

The European Travellers Club is an initiative of several European e-Ticketing Schemes in Public Transport and the Open Ticketing Institute (OTI). It is supported by several industry partners. The aim of this initiative is to ensure that all travellers in Europe can use trusted, easy and seamless **Account-Based Ticketing** across Europe, integrated with journey planning and travel information.

In the coming years, we will see a development from card-based systems to account-based systems, simply because this will allow public transport schemes to give better services to trusted travellers.

Through Account-Based Ticketing, the identity of the travellers, their means of payment and the electronic ticket are no longer stored together in one medium. This means that we can now combine existing and new ways of e-Identify, e-Payment and e-ticketing. New possibilities emerge for co-operation between authorities, financial institutions, and service providers. People can connect their account to various identifiers (a transport pass, a bankcard, an ID-card, a mobile phone).

The European Travellers Club will function as a framework for trust and integration between travellers, schemes and service providers. It does not replace them and it does not require the implementation of completely new systems. At the same time, it enables travellers and e-ticketing schemes to benefit from synergies between travelling, the internet, e-payment and e-identity.

The project pilot was introduced in Luxembourg, Germany and the Netherlands, where it was very successful. The transport authorities and transport providers involved in the pilot all stated that they would like to continue being part of the project after the pilot finishes. Similarly, positive reviews were also received by the passengers, who claimed to use public transport more due to this project.

1. To what extent it became easier to passengers to travel with multimodal transport?

Account-Based Ticketing is able to deliver the best travel experience to the members:

Just Go: Travellers never have to go to the counter, a ticket-vending machine or terminal. They simply go on a bus, tram or train. If there are gates or terminals they can use any card or NFC-phone that they have linked to their account. Their App will be able to prompt travellers' departure times, to guide them to their location and to give alternative options in case of delays or service interruptions.

Booking: Travellers can plan their journey and book a ticket at the same time. It is automatically stored in the back-office in the travellers' account. They will still use a card or NFC-phone to open a gate or to show to a ticket inspector, but there is no need to use terminals for Check-In and Check-Out.

Fares: The back-office uses daily, weekly and monthly caps to calculate afterwards what type of ticket would have been best. If you travel more, you pay less. For instance, if on Tuesday it turns out that the traveller could have paid less on Monday, he/she will be immediately credited with the difference.

Privacy: The traveller decides which service providers, payment providers, authorities and commercial parties may receive what kind of data. The traveller is the owner of the combined data. If there is commercial value in the use of that data, the traveller may require a benefit before data is shared.

A passenger survey was run at the end of the pilot, surveying approximately 500 passengers. 50% of passengers reported using public transportation more as a result of this project.

2. To what extent did the project improve fare data access?

Account-Based Ticketing will be implemented by individual schemes and transport operators in different ways. The ETC will make sure that there is interoperability across borders in Europe including security and privacy regulation.

The project did not encounter any problems regarding the access to fare data – all of the participating transport operators were thoroughly informed about the fare data access and agreed on the proposed conditions.

3. What factors influenced the achievements observed?

The main factor that has contributed to a successful pilot was the main idea of the project. The project itself did not try to change already existing systems used by the providers, authorities and the operators. Instead, the project has created an 'add-on', not interfering with different systems and payment methods in the Member States.

The funding received from the EU has helped to achieve the positive results as well. As the project deals with the cross-border travelling, which is not a priority for the Member States as it constitutes only approximately 10% of all the routes in the EU.

Finally, the part of the scheme was a governance, which included all of the parties involved in the project – organisations, providers and the authorities. This has enabled the involved parties to discuss any raising issues and agree on next steps.

4. How affordable were the costs borne by different stakeholder groups, given the benefits they received?

There are two main types of stakeholder groups benefitting and bearing the costs of the project:

- Passengers;
- Public Transport Operators.

For passengers, the project overall proved to be a great benefit, as shown by the results of the survey.

For public transport operators, investments need to be made, in terms of adding an additional software to their equipment. However, as cross border transport is often not a priority to the operators, it is unclear whether they would be willing to make such an investment themselves.

5. How relevant is the intervention to passengers?

The European Travellers Club will function as a framework for trust and integration between travellers, schemes and service providers. It does not replace them and it does not require the implementation of completely new systems. At the same time, it enables travellers and e-ticketing schemes to benefit from synergies between travelling, the internet (web and mobile), e-payment and e-identity.

6. To what extent the project continues requiring EU intervention?

The project is dependant on the EU funding to accommodate the identified roadmap.

7. What are the lessons of your project that can be useful for this study?

11 Barriers and how to overcome them

12 Solutions

A way to ensure privacy standards is by a collective organization governed by the travellers themselves, a traveller's club. The Travellers Club organized the eco-system but does not itself gather data or perform commercial services.

The Travellers Club will maintain the separation of roles between the various actors, will maintain standards, and will audit adherence to these standards by accepted service providers. This also can be done internationally, through association with the European Travellers Club.

Throughout the pilot, following barriers and their solutions were identified:

- Different National electronic systems
 - Solution: Accommodating a common EU standard on electronic systems, however this could take years and by that time it could be overtaken by other solutions. Instead, it is possible to keep the existing systems and introduce an add-on such as an identifier based on a bar code or a token.

- Low priority given to crossborder transport on the national level
 - Solution: As the crossborder transport is more important for the EU rather than the individual Member States, it is up to the EU to further stipulate similar initiatives.
- Different ways of organising e-ticketing in each Member State, at times also differing by municipalities. Hence, it is often unclear with whom should similar initiatives be discussed.
 - Solution: Finding a solution to such a situation lies in the hands of the initiative or the project. It is the project's responsibility to find the competent authority, with which negotiations should take place.

EuTravel (May 2015 – October 2017), H2020 project

The EuTravel planner is a European/cross-border multimodal journey planner that is distinct from journey planner currently available on the market in the functionalities offered for both the planning and booking phases. Current journey and travel planners do not offer user-centred travel solutions and do not always consider the environmental footprint of travel solutions, since they do not provide information on CO2 emissions when returning the travel solution to the user.

The main goal of EuTravel project is to provide a European ecosystem promoting and supporting “optimodal” travel. The backbone of the EuTravel ecosystem is a Super Travel API which provides the capability to bridge between different travel services and systems.

Another main goal of the EuTravel project is to create a multimodal planner to inspire actions at the private, and public travel-related sector for greener choices and deep knowledge to enable self-directed environmental sustainability.

1. To what extent did the project improve fare data access?

To realise the Super Travel API, EuTravel develops a common Information Model (CIM). As the project deals with multiple travel modes, including air, rail, ferry, terrestrial, etc., EuTravel development can only benefit from a clear alignment and re-use of the most relevant travel standards and models. The project does not aim to redefine existing standards but to provide a unifying view of the various travel modes from an optimality perspective.

2. What factors influenced the achievements observed?

- Interest and the involvement of the project’s partners;
- Having a very good technology lead and being able to fastly create a prototype and test it;
- The support from the European Commission;
- Involvement of the specialised partner on legal issues.

3. How affordable were the costs borne by different stakeholder groups, given the benefits they received?

All the costs were 100% funded, no costs arose neither to passengers nor to other participants.

4. How relevant is the intervention to passengers?

The EuTravel multimodal planner aims to enable travellers to plan their whole journey and calculate travel times and costs more easily, using a single itinerary confirmation for the different travel modes, with each of the booked elements embedded and transformed to an e-ticket.

Travel users can use integrated services to calculate the environmental impact of their chosen trip. All services will be accessible through a one-stop, cross-device multilingual user interface. The travel planning takes into account user inputs and preferences and displays all the available options, sorted according to the preselected criteria, including the journey carbon footprint (CO2 emissions).

The EuTravel multimodal planner empowers users to make changes to their travel habits and move away from traditional non-eco-friendly solutions. The modal split promoted through the planner can result in a significant change of travel behaviour and habits. With the planned future integration of other modes of transport into the planner, the long-term goal of achieving more sustainable travel choices will have been fulfilled, making travel a more environmentally friendly activity.

5. What are the lessons of your project that can be useful for this study:

13 Barriers and how to overcome them

14 Solutions

All the involved stakeholders in the travel industry should consider the extent to which a Code of Conduct will be required to govern “neutral” displays driven by the travellers’ failure, reluctance or decision not to complete their profile. Giving equal opportunities to all transport means

verifies user's freedom of choice and ensures a well-protected operational environment.

The experience from interaction with several key stakeholders in the travel sector indicates that as travel planners go multimodal, there will inevitably be some degree of tension between promoting transit use and providing accurate and reliable information. Nonetheless, a well-designed travel planner will be able to effectively capture and convey real-world factors, such as gas price, frequent delay and congestion that would likely make transit an increasingly attractive option for the user.

Full Service Model (FSM)² (2013 – ongoing)

The FSM initiative, founded in 2013, aims at facilitating online distribution services to the benefit of the travellers and can contribute to offering door-to-door travel solutions. To this end, ticket vendors and railways have developed an Open-IT-framework that can be integrated in already existing IT-distribution systems. When implemented, FSM can be used like an adapter and enable data exchange between different distribution systems.

FSM brings together key players in the rail and distribution sector who are committed to delivering better IT solutions for B2B distributions, with the overall objective of improving experience for consumers. The FSM initiative has developed IT specifications that make rail distribution systems interoperable (API) and more efficient.

1. To what extent did the project improve fare data access?

FSM is sector initiative to come with a technical solution, allowing rail companies to keep their distribution software systems. FSM compliance allows the rail companies to cooperate towards seamless rail travel. Implementation of FSM is estimated to be about 15-20% of the costs which would occur by replacing fully the distribution system.

While being a technical solution, FSM requires distribution agreements between players,. In addition, FSM could be potentially used in the future by operators of other than rail transport operators.

2. What factors influenced the achievements observed?

By joining the initiative, the new members commit not only to implementing the specifications but also to dedicate the resources to the maintenance of these specifications and participating in the Steering Group.

Further factors consist of the following:

- 15 The agreement between the rail companies and ticket vendors (other rail companies, GDS, travel agencies) to share the distribution data thanks to distribution agreements.
- 16 Economic component – FSM is estimated to be 15-20% of the costs vis-à-vis harmonisation of software systems

3. How affordable were the costs borne by different stakeholder groups, given the benefits they received?

FSM is estimated to cost 15-20% less than the harmonisation of software distribution systems of rail operators that would achieve similar effect.

4. How relevant is the intervention to passengers?

FSM specifications are purely B2B, there is no B2C layer. However, as a result of cooperation between the rail sector (rail companies, GDS and travel agencies), the passengers will be able to enjoy seamless travel in an easier way than today.

5. How likely are the effects/results of the project last after the project ends?

The development of FSM specifications started in 2013 and these are now available since the end of 2016, ready to be implemented. It was fully funded by rail operators and ticket vendors (GDS and travel agencies). The project has no end date, the specifications will continue evolving to embrace new technologies and ensure that they remain useful for the purposes of the sector. A user board has been created, allowing FSM users to bring feedback on potential improvements/changes.

6. To what extent the project continues requiring EU intervention?

FSM initiative did not require any EU intervention at any stage, neither at the beginning nor now or in the future.

² <http://www.cer.be/full-service-model-fsm>

IT2Rail – Information Technologies for Shift2Rail (May 2015 – October 2017), H2020 project

The project aims at providing a new seamless travel experience, giving access to a complete multimodal travel offer which connects the first and last mile to long distance journey by:

- Transforming global travel interactions into a fully integrated and customised experience;
- Providing a door-to-door multimodal travel experience, through services distributed by multiple providers;
- Helping operators to adapt their level of service, satisfy customer expectations and optimise their own operations.

The ambition of IT2Rail is to transform the European citizen's global travel interactions into a fully integrated and customised experience, traveller focused, through the introduction of radical new technologies and solutions. This should render the entire European transportation system into a natural extension of citizens' work and leisure environments, across all modes, local and long-distance, public and private.

The main concept behind IT2Rail is to introduce a ground-breaking technical enabler based on two concepts:

- The travel experience becomes the 'product' with the traveller placed at the heart of innovative solutions. This user centric shift ensures that multimodal travel services hide all the complexity of the transport system and offer a whole new door-to-door travelling experience with strong appeal, simplified access and trusted reliability.
- An open published framework will allow unprecedented services interoperability, whilst limiting impacts on existing systems, without prerequisites for further centralised standardisation. Transport industry incumbents and newcomers will discover wide opportunities to provide new services, products and new competitive business models.

In contrast with the current situation in which travellers must adjust to different interfaces, devices, protocols, conventions, procedures and tools developed over years by many retailers and operators, IT2Rail places the traveller back at the centre of the transport infrastructure and introduces ground breaking technologies in the transport domain. Travellers only need one smart device and one application to define, shop and enjoy their trip.

1. To what extent did the project improve fare data access?

At the European level, IT2Rail interoperability aims at solving fare media fragmentation by unifying the fare media into a single one. It also aims at creating interoperable fare products by defining products that every actor of the ecosystem has to support and implement. Such interoperability presents some major drawbacks.

Challenge: the larger the eco-system, the harder it gets for all stakeholders to cooperate in a competitive environment (and create interoperable products). If the considered scale is Europe-wide, it is clearly an issue.

Challenge: It is a rather costly approach as legacy systems have to be adapted to handle the common fare media and fare products. This can be a blocking point for small public transport operators.

Solution: IT2Rail has chosen to take a complementary approach to ticketing interoperability inspired by the air industry and the rail mainlines, where ticketing interoperability is independent from such technical infrastructure constraints. This approach is contractual: it aims at formalising the relationship between the transportation eco-system and the traveller by defining business processes with open specifications and interfaces and defining business artefacts shared between systems. In detail, the "ticket" is transformed into a set of three elements: The Entitlement, the Token and the Embodiment.

2. How relevant is the intervention to passengers?

With IT2Rail, the traveller is placed at the heart of the solution, which led to the development of a mobile application as interface between the traveller and the different project outputs. These set of different services are now the building blocks for the next Shift2Rail IP4 project in its various technical demonstrators addressing IT Solutions for Attractive Railway Services.

Wallet

One of the key components of IT2Rail is the **Travel Companion**, being the unified access point that grants the user access to the complete IT2Rail ecosystem and functionalities. On one side, the Travel Companion consists of a mobile application that is the interface with the user, but on the other side it also offers a "cloud wallet", a virtual space to store information related to traveller profile and trips. The Cloud Wallet is the key point where the information is stored and it can be retrieved by the different modules and components of the It2Rail ecosystem, not only the Travel Companion but also other components that need to obtain user information such as the Preferences of the booked offers, or to store information such as the bookings, entitlements, tokens or payment means.

Multimodal Travel Shopping

Users make use of their Travel Companion to access multimodal travel shopping services and using their pre-stored travel preferences. In addition, users no longer need to visit several sites to find solutions to their mobility needs, since their portable one-stop-shop should facilitate access to comprehensive travel content.

The accessible shopping services perform the work that today is left to the User to perform, by combining valid products from different transport modes/operators to produce a large choice of end-2-end itinerary solutions, from which the user can select for booking, payment and ticketing.

Travel preferences may be used to filter our unwanted transport modes, or to sort the list of solutions returned to them, according to price, durations and/or number of connections.

Ticketing

IT2Rail aims to bridge the payment gap between long-distance and local transport modes, operators and travel products, allowing a "one-click" shopping experience for integrated multimodal door-to-door travel offers and validating their travel entitlements across different transport systems.

3. How likely are the effects/results of the project last after the project ends?

The positive impacts foreseen by the project are:

- Impact 1: Improvement of the economics of the Travel Service Providers and customers ecosystem
- Impact 2: Reduction of the time to market for innovations
- Impact 3: Enrichment of passenger experience

4. What are the lessons of your project that can be useful for this study:

Barriers and how to overcome them

Solutions

- The significant obstacle, within the **technology domain**, is the high cost of interoperability between links in the supply chains i.e. the heterogeneous formats and protocols for the dissemination of timetables, availability and pricing data, from different modes/operators, results in very few (if any) one-stop shops, because of the very high cost of implementing and managing this heterogeneity. And this is the case, even if there were facilitating public transport policies or strategies of transport service providers favouring the distribution of transport products to third-party retailing operations.

Solution: The application of a semantics technology approach to achieving interoperability in the transport sector, as introduced by IT2Rail, is a major innovation, and promises to significantly remove the technology cost barriers for consolidating and aggregating content.

- Concerns about the **treatment and distribution of their data** (one obstacle to the supply to 3rd party retail operations) due to concerns about the security and quality of that data for reaching the end-User, when the supply is out of the hands of TSP proprietary distribution and retailing operations, as well as the higher cost of doing so.

Solution: The philosophy of the approach has been to facilitate the access to data wherever it happens to reside (no moving data around or collecting it for central storage – except where this is already in place and is a TSP agreed feature of legacy supply chains e.g. in the AIR sector) and to facilitate the access to expert processes e.g. journey planning, availability and pricing processes, wherever that resides in connection to the formal presentation of that

raw-data in TSP itinerary offers. This has been achieved by interlacing the Shopping Process with access to Resolvers such as the Travel Expert Resolver (see Interoperability Framework section) which provides the Shopping Process with the knowledge of who and how to access directly the relevant TSPs and/or their contracted and approved aggregators and journey planning processors. The opportunity for maintaining the quality of data provision which direct distribution channels allow for should therefore be equally available via indirect distribution channels.

Mobility as a Service (MAAS) Alliance (ongoing)

Mobility as a Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand.

The core function of MaaS ecosystem is to catalyse an open and dynamic market for the delivery of a user-centric mobility services portfolio through a unique interface. It is an ecosystem made of many different partners, sharing a common principle of delivering a door-to-door seamless mobility experience.

In the MaaS ecosystem, the mobile phone or application will be the remote control and command centre for personalized mobility, replacing tickets and cash as unnecessary elements in the operations.

1. How relevant is the intervention to passengers?

For the users, MaaS offers added value through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride, car, or bike-sharing, taxi, car rental or lease, or a combination.

2. To what extent the project continues requiring EU intervention?

A successful MaaS service also brings new business models and ways to organise and operate the various transport options, with advantages including access to improved user and demand information and new opportunities to unmet demand for transport operators. The aim of MaaS is to be the best value proposition for its users, providing an alternative to the private user of the car that may be as convenient, more sustainable, and even cheaper.

3. What are the lessons of your project that can be useful for this study:

Barriers and how to overcome them

One of the obstacles for the development of the MaaS ecosystem could be the regulatory uncertainties, creating additional risk for investors and dissuading them from investing in evolving markets. A complex regulatory framework with multiple national and international regulatory layers might hinder the development of new services and cause additional risks for investments. The aspiration to harmonize the regulation at EU level is well justified from this perspective.

One of the major challenges is the differing views and interpretations of current legislation, creating regulatory uncertainties for market actors.

Solutions

Development of the MaaS market will rely on access and openness of data, open APIs (Application Programming Interface) and more flexible transport and mobility regulations.

The competitiveness and attractiveness of MaaS services relies heavily on availability of high-quality data. The first step towards a digital transport system is harmonization of data, supported by appropriate regulation and standards. Similarly, important is to enforce safe and secure real-time access to data, as well as ensure clarity regarding liabilities of parties with principal control over the data.

When defining regulatory principles for a digitalized transport system, it is imperative to encourage the participation of all market players – both existing and new players – and avoid stifling innovation. IT technologies developed for MaaS should support both commercial-interest-driven and public-service types of MaaS deployment, even though the business models and interests behind them may vary. Open IT architecture and standardised sub-element features, such as payment, ticketing, authentication and security, will be enablers to maximise the development of the MaaS market. In addition to open standards, an imperative requirement is a high quality of the data being exchanged.

In order to build real multiplayer, multi-option market platforms, the service provider should provide each other access to essential information in a computer-readable format, including routes, timetables, stops, prices and accessibility information. Further on, ticketing and payment system interfaces should be accessible for other service providers. The establishment of an open ecosystem can be encouraged by public procurement rules, requiring interoperability of ticketing

and payment systems with other similar systems.

Better access to travel planning data is, however, not sufficient. In order to make seamless multi-modal transport a reality, it is imperative that third parties can establish a secure real-time data-connection to the vehicles in their fleets.

New roles for Public Administration

A particular important role in the development of a fully open and sustainable MaaS ecosystem needs to be assumed by the public administration, both at a local and national level. They should remove initial development barriers. Some public authorities are already moving beyond their traditional role as infrastructure providers by enabling and promoting mobility services of new entre-level players.

Recommendations for public administration authorities to encourage MaaS:

- Avoid enabling bottlenecks and monopolies and the development of closed systems
- Ensure access to the mobility market for all operators, regardless of size
- Work with open but secure architectures and standard interfaces
- Support the cooperation among the various members of the MaaS ecosystem for the exchange of data, including both established actors and newcomers.
- Take advantage of the opportunities offered by MaaS to improve the operations of transportation services to meet policy goals.
- Provide some of the initial investments necessary to jump-start the ecosystem, taking into account the equity, sustainability, and economic and job creation.
- Collaborate with private industry to develop innovative business models.

MASAI (June 2015 – May 2018), H2020 project

MASAI is a project about seamless travel and tries to build up a community of stakeholders, progressively contributing with adequate evolutions and improvements for the development of the core elements of a digital concierge, allowed by an ever-accelerating progress of technology.

The MASAI mission is to empower key stakeholders in the travel and tourism industry to enable a seamless travel experience.

The MASAI mission is made possible by creating an open ecosystem ("MASAI Mobility Community") characterized by:

- Its openness for innovation serving the customer needs.
- Its adaptability and scalability fostering cooperation in a competitive environment
- Connection between all MASAI Community stakeholders, while travellers are put in full control of their personal data.

Implemented under EC funded EU HORIZON 2020, the project addresses fragmentation in Intelligent Transportation System (ITS) deployment in Europe. The necessary development of EU-wide common minimum standards for interoperable services comes alongside with the need for an integrated approach with fair and equal access to quality multimodal services in the travel and tourism industry. The use of communication network architecture and solutions for real-time information exchange is becoming crucial.

1. To what extent it became easier to passengers to travel with multimodal transport?

The number of passengers has increased in urban transport systems

The number of passengers has increased in cross border integrated ticketing systems

Are there any studies or projects that might have this information?

According to the Google Travel Study 2014 about 80% of business travellers and 78% of leisure travellers are using online sources in their travel planning and on their path to purchase. 25% of total global travel sales are online sales, air transportation being the leading sector (46% of total air travel sales), followed by accommodation online sales (23%).

The travel and tourism industry are changing due to consumer demands and new possibilities brought to the travel and tourism industry by technology, providing new business opportunities at a fraction of the cost that was years ago. The future of travelling is based on an open ecosystem providing a seamless multimodal door-to door travel experience.

2. To what extent did the project improve fare data access?

The foundation of the non-profit organisation Masai Mobility Community (M2C) relates to the idea of expending an open community with offers specifications and tools to make simple, seamless and personalised travel experience possible. The motive of this association is as defined in the statutes "to ensure and promote the sustainability, adoption and associated follow-up development actions of the results of MASAI project for the benefit of Service Providers and mobile citizens".

M2C gathers Service Providers, who want to have their services visible and usable in third party concierge applications, who want to aggregate a lot of services in their front-end applications, and authorities.

The three main roles of M2C are Promoting, Structuring and Building Trust between stakeholders.

3. How affordable were the costs borne by different stakeholder groups, given the benefits they received?

The economics of innovation are altered with cloud-based applications. New opportunities can be tested and piloted without major start-up costs. The mobile app ecosystem and connected services are suitable for immediate adaptation, allowing to purchase resources in real time. The cloud's inherent ability to dynamically scale up or down the infrastructural commitment when demand changes on a pay-as-you-go basis has a valuable impact on the service provider's costs. Risks can be reduced preserving the potential return.

4. How relevant is the intervention to passengers?

MASAI uses and complements standardizations to aggregate services of many Service Providers in the travel and tourism industry. The aim is to provide a seamless intermodal travel experience for travellers through all stages of the travel process. To do this, MASAI integrates new technology innovations like artificial assisted intelligence, mobile technology and payment solutions.

5. What are the lessons of your project that can be useful for this study:

Barriers and how to overcome them

Stakeholders must adapt to the fragmentation of the market. The traveller is experiencing a transformation towards a new way of interacting with travel services. As opposed to former days, the traveller has not one touchpoint (with an offline travel-agency), but he is forced to choose between many offers. He can use many devices and select among thousands of apps. There are many different touchpoints, booking options with direct suppliers or opportunities to use multimodal concierge provider apps. Looking at the actual spending of technology companies into new artificially assisted intelligence (AI) and new interfaces we expect this journey to continue. New user interfaces introduced by technology companies in the form of robots, avatars and virtual digital assistants will bring more diversity into the travel industry ecosystem and will change the market share for service providers who actually have direct access to the traveller. By virtue of an increasing range of products offered and of information available online, consumers have been empowered. As a result, travel and mobility has evolved from sellers to buyers market. Fragmentation and heterogeneity of solutions have made it difficult for businesses to track consumer activity across devices and to engage with them on a deeper level.

Solutions

The promotion of seamless travel requires a closer cooperation between a large variety of industry and policy makers in order to design services as integrated ticketing/pricing and infrastructure responding to the needs of all travellers. Multi stakeholder governance models require the alignment in a multi stakeholder environment (authorities, citizens, private sector) and a supported implementation based on a suitable standard as a major driver for innovation and making travel more comfortable efficient and sustainable.

Partnerships between the private and public sector beyond the boundaries of today will be a critical factor for success.

MobiWallet (February 2014 – July 2016)

MobiWallet, started in February 2014 and with a budget of €4.3 million, of which €2.2 million is directly financed through the EU Innovation and Competitiveness Framework Program (CIP), is focused on offering seamless intermodal mobility to entire cities and regions. The goal of this European project is to develop a unified payment platform for any urban transportation mode, public or private, which will allow users not only to pay via any smartphone but also access special offers, discounts and other customized services in real time.

MobiWallet exploits new technologies, such as web-based, 2D readers, or Near Field Communication (NFC) payments, to address a range of scenarios highly relevant to the deployment of Interoperable Fare Management (IFM) systems. Focused on offering seamless intermodal mobility to entire cities and regions, dealing with multiple modes across great geographical areas and interoperate and interoperate with disparate passenger transport services.

In order to demonstrate their technologies and validate the benefits, four pilots have been chosen, each project has different objectives :

- Santander (Spain). The pilot consists in deploying a unified payment system for the different transport services: bus, public bicycle, taxi, and the city's private ferry service. The solution will include specific payment services and services for people with disabilities or reduced mobility.
- Tuscany (Italy). The pilot aims to deploy a unified payment platform which provides several interoperable transport services.
- West Midlands (UK). The pilot is proposing the development of a fare management engine that will support customers in selecting the most appropriate fare for specific journey needs.
- Novi Sad (Serbia). The system proposed aims to improve the management of the public transportation network in the city, focused on the public city bus transport network. The intention is to extend it to other transportation means (e.g. rental bikes, taxis, etc.) and thus promote and encourage the greater use of alternative transport modes.

Each pilot includes a wide range of stakeholders in the value-chain such as transport operators, public authorities, transport industry as well as a high number of end-users in order to ensure an effective deployment .

1. To what extent it became easier to passengers to travel with multimodal transport?

The number of passengers has increased in urban transport systems

The number of passengers has increased in cross border integrated ticketing systems

Are there any studies or projects that might have this information?

Citizens will be able to top up their balance on the go, anywhere in the city, and access real-time information about public transport services. MobiWallet will therefore permit the creation of a unified urban transport system while simultaneously facilitating intermodality and the combined use of different transportation modes, with a special emphasis on the needs of passengers with reduced mobility.

Moreover, the new solution will incorporate a variety of tools, including various Business Intelligence apps, to offer citizens real-time advanced services like customized journey planners; special offers and discounts to promote certain types of environment-friendly transportation modes; urban parking lot reservations and payments to facilitate private transport; apps to turn taxis into a multiple-user mode; and customized services to encourage the mobility of people with disabilities or impairments.

2. To what extent did the project improve fare data access?

The unified payment collection and management platform developed by the project will integrate the various schemes used by different transport operators, facilitating the mobile payment of bus, subway, taxi and streetcar fares, the hire of public bicycles, and even public parking lot and controlled parking zones fees for motorists.

3. What are the lessons of your project that can be useful for this study:

Solutions

The project succeeded in:

- Demonstrating the use of electronic payment services for an integrated fare management, going beyond regional issues and suitable for European scale
- Designing a common methodology for use within the pilots while gathering the interoperability requirement needed.

Smart Ticketing Alliance (2015-ongoing)

The Smart Ticketing Alliance was set up to improve interoperability between regional and national electronic ticketing systems for public transport.

Main goals of the alliance are:

- Cooperation between national and regional Smart Ticketing schemes to establish interoperable Smart Ticketing in Europe.
- Develop, agree and publish the functional and technical requirements for smart ticketing interoperability
- Cooperation for the establishment of Trust Schemes, Specifications and Certification
- Cooperation with other European and International bodies to promote interoperability in Smart Ticketing

Setting up ticketing interoperability between public transport networks requires that data is exchanged between fare management systems for serving the following business objectives:

- **Seamless travel across several Public transport networks**, i.e. enabling passengers through the purchase of a single interoperable fare product to use the transportation services of several PT networks
- **Ticketing revenue sharing**, i.e. offering Public transport authorities the ability to split revenue collection on a per usage basis when a single fare is used to travel across Public transport networks operated by distinct [and different] Public transport operators
- **Remote fare product distribution**, i.e. giving the possibility to third party Public transport networks to issue tickets on behalf of the owning Public transport authorities
- **Revenue collection protection**, i.e. that a medium reported as lost or stolen, cannot be used in other PT networks
- **Passenger journey monitoring**, i.e. allowing Public transport authorities to optimise the usage and the routing of their vehicles' fleet to better address the mobility needs of the travellers
- **Customer care improvement**, i.e. allowing any customer touch point to perform after sales operation independently of the place of issuance of the media or of the fare product
- **Facilitating mobility combining one or several Public transport modes**, i.e. providing passengers and Public transport operators' value propositions for seamless travel interoperability

1. What factors influenced the achievements observed?

Interoperable Fare Management Systems (IFMS) are becoming more and more interconnected. This need for connections between IFMS comes from different factors:

- Ticketing interoperability areas are expanding and operational data exchanges between ticketing systems are required for revenue sharing or traffic planning purposes,
- Account Based Ticketing (ABT) is developing and creates the need for back office data exchanges as the proof of entitlement to travel is held in the IFMS back office, and not in the media,
- The increasing economic pressure on local authorities is encouraging them to build ticketing revenue sharing models based on actual passenger journeys rather than on predefined pro-rata calculations, and this mandates the need for sharing operational usage data.

Many initiatives defining specifications for IFMS data exchanges do exist but most of them are at best implemented at a regional or domestic level. Anticipating that data exchanges between IFMS will only increase in the future.

2. What are the lessons of your project that can be useful for this study?

Following barriers and their solutions were identified throughout the duration of the project:

- Differences among the Member States: individual Member States have their own ways of implementations. There are also cultural differences and crossborder barriers such as

physical borders in case of non-Schengen members.

- Solutions: Initiatives such as Smart Ticketing Alliance, which could help bridge these differences.
- Differences between the national legislations and legislations which hinder crossborder multimodal transport. These could include laws which do not concern transport directly, such as competition laws, which create barriers.

Bon Voyage³ (May 2015 – April 2018), H2020 project

Bon Voyage project was set up to design a system to implement the EU Directive 2010/40/EU on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.⁴ The project aimed at designing, developing, and testing a platform for optimising multimodal and door-to-door transport of passengers and goods. The outcome of the project is an application, BonVoyage Communication System, entailing an almost constant exchange of information between travelers, tools, databases, multi-modal transportation systems, sensor networks, and forecasting models.

The travel optimisation has been performed by simultaneously considering several inputs, such as:

- non-real time characteristics (e.g., coverage, routes, schedules, type of goods, etc.) of the candidate transportation means (e.g., public transport such as bus, train, boat, taxi, air plane; private transport such as car, bicycle, walking, cooperative modes like car-sharing, trucks);
- real-time requirements (e.g., availability of private transport means for horizontal, user-to user sharing, traffic congestion, temporary road barriers, lane closures, temporary speed limits, new stops, available space and weight to complete the load etc.);
- user profiles (including user preferences, needs and expectations);
- users' feedback (also in real time and under the form of participatory sensing);
- dynamic tariff schemes.

The main purpose of the project was to design a special database making it easier for the National Access Points (NAPs) to share the information collected at the national level. This way, the information would be made available not only at the national, but the EU level harmonising the information and National Access Points.

Although the project has been finished in April 2018, none of the NAPs uses the developed database yet.

1. To what extent it became easier to passengers to travel with multimodal transport? Is there data showing if:

The number of passengers has increased in urban transport systems

The number of passengers has increased in cross border integrated ticketing systems

Are there any studies or projects that might have this information?

As the designed application is still not in use, there is no data available on the increase or decrease of passengers in transport systems etc. However, the purpose of the application is to make it easier for passengers to travel multimodally, by gathering the EU28 fare data information. Therefore, the application could potentially increase the number of passengers using public transportation and travelling multimodally.

2. To what extent did the project improve fare data access?

If in use, the application would gather all the data collected from the NAPs, providing passengers with the EU wide data on fare data, allowing them to travel multimodally.

3. How relevant is the intervention to passengers?

This intervention is highly relevant to passengers. Due to different systems used for collecting fare data used at the national levels, there has not been a database gathering this data for crossborder travels. Using BonVoyage Communication System, the passenger would be able to travel between the Member States using different modes of transport.

³ <http://bonvoyage2020.eu/>

⁴ <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32010L0040>

4. To what extent the project continues requiring EU intervention?

The project has finished in April 2018; however, the developed database is still not in use. The EU intervention would be necessary to encourage the NAPs to synchronise the systems they use and then share the collected data into a European-wide platform. A technical solution to achieve this is necessary.

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