

GOVERNANCE OF THE INTEROPERABILITY FRAMEWORK FOR RAIL AND INTERMODAL MOBILITY

D2.3 Analysis of impacts on the governance solution

Due date of deliverable: 30/04/2018

Actual submission date: 06/06/2018

Leader/Responsible of this Deliverable: Guido Di Pasquale (UITP)

Co-Authors: Zain UI Abdin (UITP), D. Kuzmina (UITP)

Reviewed: Y

Document status		
Revision	Date	Description
0.2	03/2018	First issue: Table of Content and guidelines for content
1.0	05/2018	Second issue: First draft
1.1-1.2	05/2018	Contribution from EPF
1.3	05/2018	Contribution from Trenitalia
2	06/2018	Quality Check from RINA

Project funded from the European Union's Horizon 2020 research and innovation programme		
Dissemination Level		
PU	Public	x
CO	Confidential, restricted under conditions set out in Model Grant Agreement	
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

Start date of project: 01/11/2016

Duration: 24 months

EXECUTIVE SUMMARY

To design and develop a sustainable and prosperous IF governance, the requirements from the different actors in the transport chain need to be mapped and analysed.

This analysis is a complex issue due to the large variety of actors involved: customers/travellers, transport authorities, transport service providers, transport information provider, travel data and service providers, retailers, travel agencies, distributors, MaaS providers, IT suppliers and software developers, payment service providers, international associations, standardization entities and community groups or social networks.

All of them have a direct or indirect interest in the implementation of seamless multimodal services supported by an IF enabling multimodal multi-standard distributed data management.

Within GOF4R Work Package 2 (“User Demand”), the factors which influence the adoption of IF services were derived by means of interviews and questionnaires, meetings, surveys and workshops, with the aim to reach a wide variety of stakeholders playing a role in the travelling market.

This document provides an overview of the needs of these stakeholders and the potential impact on the governance of the IF. It addresses different market actors’ needs, expectations, barriers and benefits while adopting the interoperability framework, summarising the outcomes of use cases provided in D.2.2 Analysis of the demand of market actors for the IF. It also presents the main outcomes of D2.1 Analysis of the demand of travellers for the TC and formulates recommendations with regard to IF governance and future TC development from the point of view of the end-users.

Deliverable D2.3 thus provides useful input for GOF4R Work Package 5: Governance and management structure for interoperability framework and its relevant deliverables, while at the same time the insights gained will be of interest to other Shift2Rail IP4 projects as well.

ABBREVIATIONS AND ACRONYMS

Abbreviation	Description
EC	European Commission
EU	European Union
GA	Grant Agreement
GoF4R	Governance of the Interoperability Framework for Rail and Intermodal Mobility
H2020	Horizon 2020 framework programme
IF	Interoperability Framework
IoT	Internet of Things
IP4	Innovation Programme 4
IT	Information technology
IT2Rail	Information Technologies for Shift2Rail
JU	Shift2Rail Joint Undertaking
LRT	Light rail transit
MaaS	Mobility as a Service
PRM	Person(s) with Reduced Mobility
PT	Public transport
PTO	Public Transport Operator
S2R	Shift2Rail
TC	Travel Companion
TSP	Transport Service Provider
UITP	International Association of Public Transport
UX	User Experience
ZSSK	Železničná Spoločnosť Slovensko

TABLE OF CONTENTS

Executive Summary	2
Abbreviations and Acronyms	3
Table of Contents.....	4
List of Figures	5
List of Tables	5
1. INTRODUCTION	6
2. IDENTIFY FORCES INFLUENCING ADOPTION	8
2.1 END USERS/CONSUMERS	8
2.1.1 RECOMMENDATIONS BASED ON (UX) EXPERT INTERVIEWS	8
2.1.2 RECOMMENDATIONS FROM ETHNOGRAPHIC WORKSHOPS.....	10
2.1.3 RECOMMENDATIONS FROM INTERNATIONAL EXPERT WORKSHOP	13
2.2 MARKET ACTORS	14
2.2.1 MARKET ACTORS IN DIFFERENT USE CASES	15
2.2.2 STAKEHOLDERS' NEEDS AND EXPECTATIONS	17
2.2.3 RECOMMENDATIONS FROM MARKET ACTORS.....	20
3. INTRODUCTION INTO GOVERNANCE OF THE IF.....	22
3.1 ROLE OF GOVERNANCE IN INTEROPERABILITY FRAMEWORK.....	22
3.2 WHY GOVERNANCE IN INTEROPERABILITY FRAMEWORK.....	23
4. CONCLUSIONS.....	24
5. REFERENCES	25

LIST OF FIGURES

Figure 1: Influence of multiple stakeholders in a transport chain	6
Figure 2: Barriers to using the Travel Companion	12
Figure 3: Main needs and expectations of users regarding the IF	24

LIST OF TABLES

Table 1. Different use cases, their respective description and requirements to the IF and its barriers	15
Table 2. Highlight of the needs and expectations of the actors representing different modes of transportation	17

1. INTRODUCTION

The objective of the GoF4R project is to define sustainable governance for the IF semantic technologies that are being developed under the IP4 Shift2Rail programme.

IP4 (IT solutions for Attractive Railway Services) is one of the Shift2Rail Joint Undertaking’s long-term Innovation Programmes. S2R aims to achieve a modal shift from road transport towards more sustainable transport modes such as rail. Within IP4, the objective is to create a seamless multimodal travel experience by providing travellers with smart, personalised services to facilitate each stage of the journey.

Travellers can access all these services through their Travel Companion (TC), which works as a ‘front end’ user interface, giving users full control of their door-to-door travel experience. Travellers can use the TC (which considers personal preferences, including mobility constraints) to plan their trip, manage bookings and related payments, validate entitlements, navigate at interchanges and, in case of disruptions, find alternative solutions for re-routing and re-accommodation.

In the ‘back end’, the Interoperability Framework (IF) guarantees technical interoperability of multimodal services.

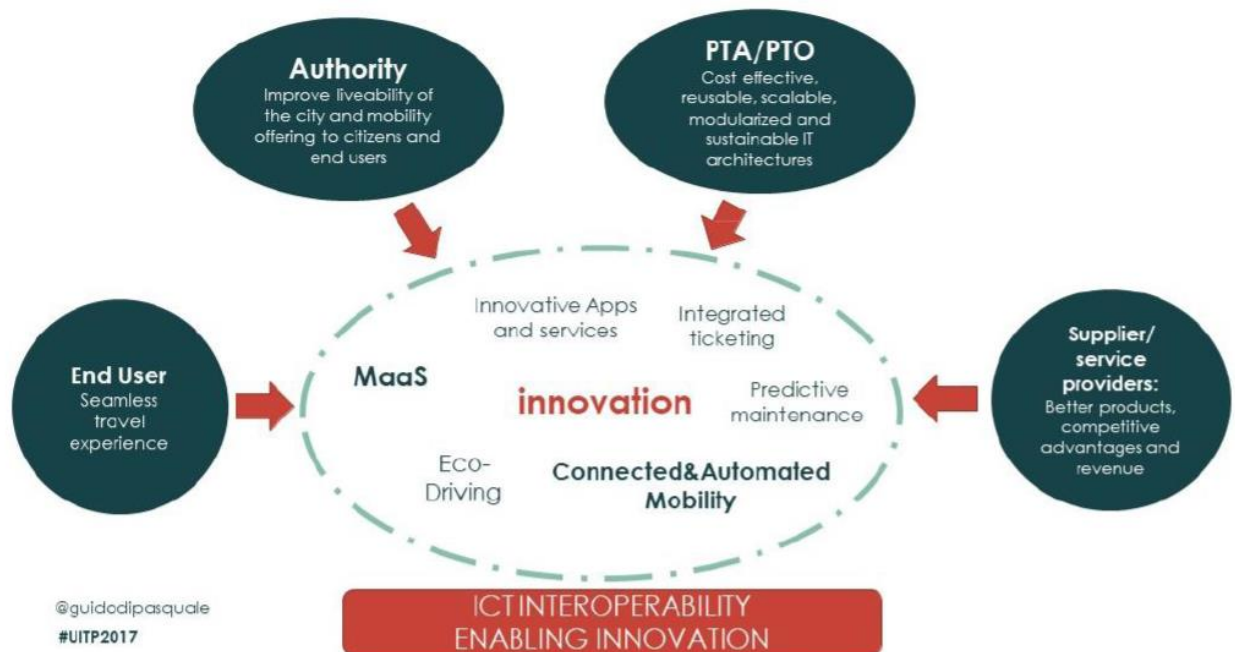


Figure 1: Influence of multiple stakeholders in a transport chain

To design and develop a sustainable and prosperous IF governance, the requirements from the different actors in the transport chain need to be mapped and analysed. However, this analysis is a

Contract No. H2020 – 730844

complex issue due to the variety of actors, transport modes and travel services across Europe. There are indeed very numerous stakeholders providing travel services and/or influencing the travel market and/or benefiting from it at different territorial levels (local, national or international). All of them have a direct or indirect interest in the implementation of seamless multimodal services supported by an IF enabling multimodal multi-standard distributed data management, which is an ultimate objective of S2R IP4.

2. IDENTIFY FORCES INFLUENCING ADOPTION

This section analyses market trends for interoperability platforms inside Europe and customer requirements, both at local and at EU level. Within GOF4R Work Package 2 (“User Demand”), the factors which influence the adoption of IF services were derived by means of interviews and questionnaires, meetings, surveys and workshops, with the aim to reach a wide variety of stakeholders playing a role in the travelling market. The main outcomes are presented below.

2.1 END USERS/CONSUMERS

As travellers do not interact directly with the Interoperability Framework, Task 2.1 within GoF4R has focused on the different functionalities based on or enabled by the IF, which the traveller can access through her or his TC. Interviews were conducted, workshops were organised in different countries, and finally, an EU-level expert workshop was held to validate the findings. The results of this process are described in more detail in Deliverable 2.1. Based on its outcomes, recommendations with regard to IF governance and future TC development are described below.

2.1.1 RECOMMENDATIONS BASED ON (UX) EXPERT INTERVIEWS

- Registration may form a barrier to use the TC. Issues raised include the time it takes to register as well as concerns about security and privacy. Similarly, setting preferences should not be onerous and take up too much time. It should be possible to use essential functions such as journey planning without registration or setting preferences.
- Registration and setting preferences should be kept simple, and information should only be requested when it is relevant and has a purpose so that users can understand the benefits.
- The TC should be ‘smart learning’ and be able to ‘remember’ preferences. However, this should be an optional setting and users must be able to quickly clear or edit their preferences.
- A user might want to have multiple profiles with different preferences.
- The TC should be transparent on options that a passenger gets when he plans a trip (linked to preferences).
- The complexity of the tool was mentioned as the most significant barrier, so simplicity should be prioritised.
- Another primary barrier is trust: the TC must provide a trusted platform for e-commerce and build up trust in providing the most appropriate ticket prices and real-time info.
- The opinions were mixed regarding whether payments should be pre- or post-trip. The advantage of post-payment is that it is easier to provide compensation/discount in case of disruption.

Contract No. H2020 – 730844

However, customers are used to pre-payment for purchasing public transport journeys. Post-payment could be an option for business users or frequent travellers.

- The TC should allow users to buy tickets for others.
- Most respondents felt there is no benefit to storing tickets on the NFC chip of the E-passport. Instead, they prefer QR codes which could be printed or displayed on a mobile device.
- Flexibility was highlighted as a critical user requirement and the ability to cancel or change tickets, although charges may apply for increased flexibility. There was concern that although a single ticket may be simpler, it may result in less flexibility to change sections of the journey.
- Non-transport related information may be useful if it does not overcomplicate the tool. Its value seems limited as most people use other sources to find such information.
- In case of disruptions, it is essential that the TC does not merely alert users on a delay, but informs them on the impact this will have on the different steps of the journey and finds the best alternative.
- The ability to provide feedback on the tool and journey was considered a useful functionality.
- After the trip, the TC can provide useful information especially if something has gone wrong, e.g. contact information of the transport company, information about passenger rights, how to file a complaint or claim compensation, where to find lost property, etc.
- On-going assistance could be provided through the tool and would be particularly useful for PRM, children and the elderly. However, it may come at an additional cost.
- There were mixed reactions on the passenger to passenger communication. This could be useful, e.g. to share a taxi, but could also degenerate.
- Value added by the Travel Companion would be mainly:
 - The ability to buy tickets
 - Intermodal service planning offering (all info on one platform)
 - Information on compensation (protection and assistance if something goes wrong)
- The main incentives for users to take up the TC, according to the interviewees, are that it is a user-friendly tool, offering all services on one platform, thus saving the user time and money, and that it offers help (protection and assistance) during and after disruptions.
- Using the Travel Companion should be free of charge unless it offers additional services.
- The Travel Companion should be available in the language of the user.

2.1.2 RECOMMENDATIONS FROM ETHNOGRAPHIC WORKSHOPS

Five workshops were conducted in 4 distinct places with diverse backgrounds, in order to further discuss a number of topics in more detail.

The most important outcomes regarding the topic **'preferences'** can be summarised as follows:

- The possibility to set preferences is generally considered a great motivation element for using the TC. However, if it takes up too much time or is too complicated, it can be a barrier to use the TC.
- Users should be able to define preferences and edit them at any time. Flexibility is important.
- Some participants mentioned they would like to be able to switch between different profiles, each with their preferences.
- The TC should be 'smart learning,' i.e. learn from previous choices. It should be transparent at any time how the user's data is treated. Privacy is a concern, especially for elderly users. Remembering preferences should be a setting the user can turn on or off.
- Setting preferences should not be obliged; a fast search without setting preferences should also be possible. In that case, the TC should show a list of alternatives and recommend one, based on general habits of travellers' behaviour.

These are the main outcomes of the workshops on the theme **'Travel related /v/ non-travel related information'**:

- Travel information should be real-time, but some information should also be available offline.
- Less is more: necessary information should be provided for each travel request, and additional information should be provided based on user preferences.
- During the trip, information on transfers is considered useful.
- There was a consensus that non-travel related information should be limited and that it can be found through other sources.
- Context-dependent information can be a motivator to use the TC, but users should need to activate it (some people may have concerns regarding privacy).
- The possibility to communicate with other passengers on the route could be optional.
- The following information is considered most important (besides price, travelling time, mode of transport and transfers): facilities at transfer hubs and on board, transfer time, crowdedness/seat occupancy, barrier-free access, (history of) delays.

About the topic **'Disruption / Feedback'**, these were the workshops' main conclusions:

Contract No. H2020 – 730844

- In case of disruption, users should receive information about travel alternatives and be offered the possibility to buy a new ticket/entitlement.
- It would also be useful to inform passengers of the cause of delay and, if needed, on additional services such as where to find meals, entertainment or accommodation.
- Peer users could provide updated and real-time information additional that provide by the official communication channels. Such information should be checked and moderated.
- The best way to be informed is through notifications on the smartphone or, alternatively, via SMS. A hotline/call centre is also an option, especially for older people.
- If there are no extraordinary events, information throughout the journey should be limited.
- The Travel Companion could offer a kind of ‘travel insurance’ as an extra service. In any case, it should inform passengers on their rights and give guidance on how to get a refund, file a complaint, and contact the transport provider.
- Users should be able to give feedback on their trip, e.g. by means of a short questionnaire. Giving feedback should be easy and not take up too much time. Feedback should be possible in different languages.

Main barriers to use the TC are:

- Accuracy, related to information: The tool should be able to manage extraordinary situations in real-time, signalling (as some existing apps already do) delays, strikes, changes in the status quo. Information (particularly, related to disruption) should be updated as often as possible, and the re-planning should be guaranteed and timely.
- Reliability related to information provided by the TC has been evaluated as a vital issue. The TC should be able to consider all feasible options (first and last mile, noteworthy deals and prices) and show them to users, so that they can check and choose the best alternative.
- Profile/preferences should be easy and fast to fulfil. Users should be able to decide which information they want to register, and it should be possible to enter only very little information. It should be possible to use the TC without creating a profile or setting preferences first.
- The complexity of the tool/app: Participants agreed that it is a key issue to provide a smart and intuitive interface, avoiding complex and too technical issues.
- Lousy support during and after the trip is also indicated as a barrier. Users want to communicate with the tool when necessary and get personal assistance. Giving feedback should be as comfortable as possible. A simple yes/no question, choosing a smiley face or a sad face, thumbs up or thumbs down, are preferable over lengthy questionnaires. Gamification and rewards could help to incentivise travellers to give feedback on the services. It would be useful if user feedback could also be given during the journey.

Contract No. H2020 – 730844

- Cybersecurity: The TC should be as reliable/safe as competing applications in terms of online payment. The system must offer the payment method(s) that people prefer (which can differ from country to country). It may be a problem only if the user is generally suspicious of using any form of online payment.
- Existing habits: Most people already use an alternative app. TC has several competitors from which it must differentiate clearly showing what its added value is. Habits become a problem when a user has loyalty to a specific company that guarantees him some benefits. The TC platform could also release a fidelity card to avoid the issue.
- Privacy: Privacy concerns are related especially to profile (personal data) and purchasing (card details); however, this is not considered as one of the most significant barriers.

Barriers for the use of the Travel Companion

<p>Personal information / preferences</p> <ul style="list-style-type: none"> - Time-consuming - Privacy and security - Ease of change - Transparency (options you get) 	<p>Information provided by TC</p> <ul style="list-style-type: none"> - Reliability (are all options integrated) - Accuracy (realtime info, up-to-date) - Transparency (options you get) - Complexity (too much info) 	<p>Communication / feedback</p> <ul style="list-style-type: none"> - Bad support - Reliability (help function) - Privacy
<p>Payment / transaction</p> <ul style="list-style-type: none"> - Trust - (Cyber)security - Complexity - Habits 	<p>Tool / app</p> <ul style="list-style-type: none"> - Complexity - Habits - Added value compared with other apps - Extra cost / savings - Use by family and friends 	<p>Providers</p> <ul style="list-style-type: none"> - Trust - Reliability

Figure 2: Barriers to using the Travel Companion

Main incentives to use the TC are:

- Usefulness of the TC: Today, organising complicated multimodal European wide trips requires much effort and is time-consuming. Travellers must adjust to a variety of interfaces, devices, tools etc. The IF and the TC could make the planning & buying process a lot easier.
- Better protection and passenger rights: In case of disruption, the TC should offer full assistance, informing the user on alternatives. If the original plan is no longer feasible, and on passenger rights and reimbursement procedures. Currently, passenger rights apply independently to each transport mode and only under a single contract of carriage.
- Accurate and reliable information: Consumers need to feel confident that they receive an overview of the best travel solutions, considering preferences and needs. Reliability (of data, information) and transparency (e.g. how will the user’s personal data be stored and processed) are two critical

Contract No. H2020 – 730844

aspects that will determine whether a traveller will use the TC. Crowdsourcing can be a useful tool to complement information from 'official' sources.

2.1.3 RECOMMENDATIONS FROM INTERNATIONAL EXPERT WORKSHOP

An international workshop with IP4 and other experts was held in Brussels on December 5th, 2017, in order to validate the findings of the end-user research done so far as well as to detect (potential) implications for the IF and its governance. Experts were invited from various (mobility) sectors both inside/outside of the GOF4R project. Following were the issues addressed:

- TSP should be stimulated or even obligated to share data. For instance, a contractual clause could be included in Public Service Contracts with PTOs.
- Data on cycling infrastructure shall be integrated into systems of transport operators. Also, it is important to integrate the data of small(er) service providers.
- Datasets shall be of high quality and security standards to avoid data-scraping.
- Improve data provision by adding mobile phone sourced data.
- Distinct approaches exist to open source data for EU countries.
- Newer regulations may provide a platform for the easier exchange of data.
- New business models can be developed to incentivise TSPs to share data and provide good data sets.
- One of the most significant barriers for a small-scale developer is the economics balance between marketing costs and ticket revenues.
- A key issue is the speed and accuracy of the process to investigate the 'raw' data and turn it into useful information for the customers.
- Segmenting the data set (e.g. based on the type of trip or the type of traveller) can facilitate that the data fit the user's personal needs.
- Individual datasets should not be published. The EC could prepare guidelines on how to implement the GDPR in practice, which would save developers and TSPs time and effort.
- If existing UX research could be shared between all IF-stakeholders, this could be an incentive to cooperate (especially for start-ups who don't have large research budgets).
- The experts suggested making the TC a modular tool so that users can start with a 'simple' version and if needed afterwards upgrade/expand.
- If possible, developers should adopt the principles of universal design to make sure also PRM can use the TC.

Contract No. H2020 – 730844

- When a disruption occurs, TSPs should be forced to cooperate.
- A harmonisation of passenger rights across all modes is desirable.
- As an extra (paid) service, the TC could offer users insurance that guarantees to reschedule in case of disruption. Paid in advance, this could be economically feasible.
- Crowdsourcing could be an effective way to improve the reliability of data, on the condition that there is a critical mass and that cross-reference with official channels is made.

2.2 MARKET ACTORS

Current market trends reveal a general increase of PT services and shared mobility services in urban periphery.

The volume of European users of public transport and a variety of PT services has been increasing as well as the use of shared mobility (the numbers can be found in GOF4R D2.2. Analysis of the demand of market actors for the Interoperability Framework). One of the reasons of their boosting is a digitalisation of the society. The adoption and increase in the use of digital and computer technologies refer to improvement of processes, gaining productivity and establishment of new business models (e.g. ridesharing, MaaS, etc.). Novel forms of mobility in combination with traditional public transport need a technology that can be a key enabler.

Basically, a new complex mobility ecosystem has appeared that unites different stakeholders, enables the transactions between them (e.g. booking, invoicing, payments, etc.), interacts with the customer through a universal user-friendly interface, acquires and exchanges operational data, and processes it into data used for analyses by stakeholders. In such an ecosystem, different actors are involved: IT providers and software developers (technical actors), business users (e.g. transport operators and authorities, travel service aggregators and providers, etc.), and citizens/travellers. In addition, IoT may accelerate the growth of the data pool that can be exploited.

Another trend in PT that should be mentioned is the increased importance of multimodal travelling that combines different modes of transport in one journey. Multimodal and intermodal journeys enable MaaS where all operators of a transport system are interconnected, including infrastructure data, service data and payment services.

Hence, this global market approach leads to technological advancements through interoperability of multiple modes. This requires a proper governance structure, appropriate market regulation, on various territorial levels. This shall be set up with prejudice that local authorities have sufficient responsibilities at territorial level.

2.2.1 MARKET ACTORS IN DIFFERENT USE CASES

This section summarises various potential use cases in which the IF may play a beneficial role, which may ultimately lead to identify and study possible governance models. This section contains the short description of six different use cases from six different countries. For each use case, the needs of the actors involved are described. The full study of these use cases is presented in GOF4R D2.2. Analysis of the demand of market actors for the Interoperability Framework. Table 1 presents the list of use cases and their respective description.

Table 1. Different use cases, their respective description and requirements to the IF and its barriers

Use case	Country	Description
9292	The Netherlands	<p>Provider of real-time door-to-door public transport travel information for all kinds of passengers within the Netherlands.</p> <p>Needs from the IF: reliability, improvement of the existing services through better travel information, opportunity to create new services (e.g. MaaS), more personalised services, analysis of big data from passengers for improvement of services and creation of promotion activities, mandatory involvement of authorities and organisations that unite operators, precise definition of what can be shared in the IF</p> <p>Barriers: privacy and security matters regarding personal information, operators' internal competition</p>
Reiseplanen A/S	Denmark	<p>The most used search engine for public transport in Denmark. It offers itineraries for all railways and buses, as well as certain ferries to islands, based on data from individual traffic companies.</p> <p>Needs from the IF: international journey integration, price building based on the whole journey including abroad part</p> <p>Barriers: not all countries are the same in their level of the IF knowledge and development, Google data exchange format deployed throughout the world can cause the EU standard to fail.</p>
UK Railway	UK	<p>Transport for London approach, Bus Network, My Bus application and multimodal ticketing in the UK.</p> <p>Needs from the IF: governance of the processes at interchange zones with other modes of transportation, identify interfaces between all the parties involved in managing and serving the interchange facility including external bodies, particularly the fire brigade, ambulance service, police and local authorities, establish</p>

Contract No. H2020 – 730844

		<p>clear responsibilities for managing these interfaces, ensure that interchange facility operates successfully</p> <p>Barriers: security and data protection, the competition of operators in the schemes with common pricing, different regulatory regimes of different transport modes, contractual and liability issues relating to responsibilities of ticket vendors for travel by another operator</p>
Railway Slovakia	Slovakia	<p>The railway passenger transport operators in Slovakia - both state and private types - have their own closed system that does not communicate with any other existing application. Use cases presented: ZSSK, RJ, and Leo Express.</p> <p>Needs from the IF: united ecosystem for ticket booking and purchasing, clear rules for delisting and exchanging data on checked/cancelled tickets, the EU united reservation system of tickets available in EU languages, an app for users available for smartphones, availability to use the loyalty programs</p> <p>Barriers: readiness of the operators to go out of their internal closed systems to the EU-level platform.</p>
Poseidon	Czech Republic	<p>The official mobile app of the coordinator of the Integrated Public Transport System of the South Moravian Region – IDS JMK intended for the provision of information on IDS JMK as well as for the sale of the entire range of the single and one-day tickets valid in all settings of the public transport including IDS JMK.</p> <p>Needs from the IF: participation in the IF should be cheaper than the creation of the own ecosystem, speed up of the information exchange.</p> <p>Barriers: breakdown of revenue and expenses can be a subject of confidentiality, so this could be a barrier to the creation of a combined ticket or MaaS subscription.</p>
Ferrovie dello Stato (FS)	Italy	<p>One of the largest industrial groups in Italy. They aim to become a player of intermodal mobility at international level.</p> <p>Needs from the IF: generation and update of a semantic graph that allows the publishing of transparent and reliable information, retrieval of the ontology by TSPs, annotation of the network dataset, providing a universal description of different concepts (geographical areas, stop places,...), annotation of the service descriptors, providing integrated information derived from different</p>

Contract No. H2020 – 730844

		<p>TSPs, system of information validation, maintenance of semantic resources.</p> <p>Barriers: interoperable rail has to provide information in the standardised TAP TSI format while other modes of transport don't need to and don't do it to reduce the constraints of TAP TSI, the ability of TSPs in using systems and the lack of knowledge, lack of trust.</p>
--	--	--

The major categories of market actors that can be identified from these use cases are: customers/travellers, transport authorities, transport service providers, travel data and service providers, retailers, travel agencies, distributors, MaaS providers, IT suppliers and software developers, payment service providers, international associations and community groups or social networks (the description in GOF4R D2.2. Analysis of the demand of market actors for the Interoperability Framework). This list of defined stakeholders can be the initial input for GOF4R D.5.1 Deployment Roadmap.

2.2.2 STAKEHOLDERS' NEEDS AND EXPECTATIONS

Within the European context, a wide range of stakeholders such as users and market actors exist (i.e. rail, coach, air, urban transport), each with their own perspectives, responsibilities and needs. The following section aims at highlighting stakeholders' needs and expectations within different travel modes concerning the Interoperability Framework. Since the Interoperability Framework adopts a systemic approach, this analysis requires a systemic perspective.

Additional case studies were identified either through an interview with potential users of the Interoperability Framework representing different transport modes or through desk research. The discussion has been developed grounding on different sectors: rail, coach, air and urban transport. From these cases problems and opportunities linked with the Interoperability Framework and the stakeholders involved have been analysed and described according to a common structure elaborating key characteristics, benefits, and barriers considering multimodal, i.e. rail, coach, air and urban transport.

Table 2. Highlight of the needs and expectations of the actors representing different modes of transportation

Use case	Country	Needs, expectations and vision
Rail: FS	Italy	<p>The strategic company's pillars up to 2026:</p> <ul style="list-style-type: none"> - Integrated mobility with the involvement of many operators; - Integrated logistics, with a radical re-planning of the commodity segment;

Contract No. H2020 – 730844

		<ul style="list-style-type: none"> - Both rail and road infrastructure integration; - Internationalization; - Digitisation development. <p>The main functions that the FS expects from the interoperability framework is described in Table 1.</p>
Rail: Prague-Ostrava route	Czech Republic	<p>The expectations of Czech Railways in the IF are:</p> <ul style="list-style-type: none"> - Decreasing the tariff disintegration between operators and the interoperability of the ticket systems; - Speed up the information exchange.
Coach: FlixBus	Germany	<p>The opportunities for the IF from FlixBus perspective: Integration of the long-distance transport with urban for door-to-door travel experience and synchronising their schedules;</p> <p>As an outcome, it will help to increase the coach capacity.</p>
Air		<p>Interoperability in air can be considered by three types:</p> <p>Airports: intermodal interoperability representing different options to reach the airport from any point.</p> <p>Air navigation services providers: Interoperability in air is considered as the capability of two and more networks, Air Traffic Management systems, components or applications to exchange information and to be able to use this information for technical or operational purposes, so enabling them to operate effectively together.</p> <p>Airlines: airline interoperability provides service with a connection using two and more different airlines without any segmentations of the fare.</p>
Urban Mobility		<p>The main benefits expected from the adoption of the IF solutions could be linked to the new API economy and technologies that can allow the achievement of the following aspects:</p> <ul style="list-style-type: none"> - Aggregation of real-time information; - Enable a single point of contact for travellers and full service provider (planning, booking, paying, billing) of the entire multimodal trip on one interface; - Create an ecosystem of partners reaching the higher number of providers to keep the promise of a total mobility; - Enable to offer tailored solutions considering customer preferences, lifestyle and budget and trying to achieve a

Contract No. H2020 – 730844

		balance between legal requirements and need for transparency; - Boosting the potential of new revenues for all the actors within the mobility ecosystem
--	--	--

Key Characteristics

- Flexibility. The TSP will be able to write software to consult the semantic graph in order to obtain data, without being constrained by the need of adopting centralised platforms or single standard (if not explicitly requested by regulations);
- Accessibility. The IF guarantees the access to different companies irrespective of their size and economic profile since it does not require massive investments from the other TSPs (hence avoiding entrance barriers);
- Customizable. The IF can be tailored by different TSPs, exploiting specific features even referring to specific requirements depending on the different types of services (e.g. mainline rail, public services...);
- Reliability. The IF introduces some requirements in terms of the quality of data published (e.g. setting a maximum number of failed data validation attempts) and validation process;
- Effective governance. The IF is characterised by a simpler but more effective governance structure. The central governance is supposed to play a role only in some specific situations such as in case of market failure, for guaranteeing the access to every player, in order to extend the network.

Benefits

- Aggregation of real-time information;
- Providing a single point of contact for all trip related queries, i.e. planning, booking, payment and rescheduling;
- Integration and aggregation of many mobility service providers across all modes of transport trying to create an ecosystem of partners reaching a higher number of providers to keep the promise of total mobility;
- User-oriented tailor-made systems understanding customer needs, preferences, lifestyles, budget and maintaining a balance between legal requirements and transparency;
- Creation of new potential revenues for all the actors within the mobility ecosystem;
- Creation of new potential services for all the actors within the mobility ecosystem;

Contract No. H2020 – 730844

- Central platform for distribution, exchange and synchronisation of information for various mobility stakeholders;
- Updated real-time information will provide more freedom, choice and flexibility to users & TSPs.

Barriers

Some issues which are difficult to solve and may prevent a large IF market uptake are following:

- Different, complex policy situations involving multiple stakeholders i.e. space usage, information storage, contract procedure, insurance policies, data sharing and transparency requirements;
- Technological barriers due to lack of resources, and knowledge;
- Data sharing issues, i.e. licensing, and regulations;
- The right balance between different private and public transport modes
- Integration of the first mile and last mile services in terms of information, pricing, and payment.

2.2.3 RECOMMENDATIONS FROM MARKET ACTORS

Following are the general recommendations obtained after surveying stakeholders about the impact of the Interoperability Framework and semantic technology on their businesses.

- Need to integrate wider European interoperability ultimately integrating diverse modes of transport which yields more business opportunities.
- Market-driven approach for IF, with less EU regulations. For appropriate governance for IF, it shall define roles, rules, tasks, must be open and inclusive. However, the definition of what data can be shared for transport services should be defined with the involvement of EU level regulations.
- Need of emphasis of in-depth training within companies for Interoperable services, i.e. a Semantic web of technologies (OWL/SPARQL, etc.). This will help overcome a barrier regarding needed skills in the adoption of the Interoperability Framework, since not all the technical personnel in companies is well trained for IF technologies due to lack of academic education.
- Hence main barriers to the adoption of IF are lack of adaptation cost with legacy systems, lack of business experience and lack of skills.

The following are barriers which the IF cannot overcome:

- The right balance of transport modes in cities, i.e. care should be taken not to replace mass transit with on-demand services in urban areas.

Contract No. H2020 – 730844

- The IF cannot overcome issues such as data and service sharing to provide an integrated transport offer.
- The market actors rely on IF network services ensuring minimum services for potential IF ecosystem. It is significant to give an appropriate representation of the IF ecosystem to all strategic partners: all operators, commercial partners, general users, and public representatives. It is also very important for all market stakeholders to take responsibility in order to be able to provide seamless multimodal services even though some stakeholders may be potential competitors. They shall not only collaborate with each other but also with other entities, i.e. concerning payment structure, technological perspective, IT services, etc.

Market demand driven integrated seamless support aims to fulfil potential customers' needs and expectations. By providing integrated services, it will attract more users, at the end improve its relationship with users and provide more chances for Mobility as a Service for end users.

3. INTRODUCTION INTO GOVERNANCE OF THE IF

This section presents the initial information about the governance of the IF and its role there. This introduction to the connection with expectations of users should be a first input in the GOF4R WP5 Governance and management structure for interoperability framework.

3.1 ROLE OF GOVERNANCE IN INTEROPERABILITY FRAMEWORK

The GoF4R project aims to design an effective governance structure for the Interoperability Framework promoting its adoption and sustainability. The governance consists in the identification of **roles** to be assigned, **tasks** to be associated with each role and in the definition of **rules** to be applied.

The design of the governance structure for the IF must consider: (i) the structure and dynamics of the market for multi-modal mobility services; (ii) the regulatory framework for mobility services and related technology standards at the European, National and Local administration level, and (iii) the market and maturity of Semantic Web technologies for interoperability.

Moreover, roles, tasks and rules should be derived from the analysis of the IT2Rail Interoperability Framework.

The governance process of the Interoperability Framework shall consider not only the technical aspects but also strategical aspects covering business, management and legal perspectives. Governance has a critical role in solving, aligning, proposing solutions to complex procedures involving multiple stakeholders in the usage of a single IT service, i.e. Travel Companion.

For GOF4R context, governance is defined as management, alignment, organising the procedure for TC and S2R services. For a broad public acceptance, GOF4R Work Package 5 will address the actual need for a governance structure and management process of the IF providing solutions.

A governance management structure assigns governance activities, rights and obligations to governance roles that interact with the market actors and users through IT services, i.e. TC in the execution of the IF services, i.e. Rail, Urban transport etc.

The role of Governance in Interoperability is to achieve the following key objectives:

- Design of an efficient management structure to perform the governance processes;
- Identify suitable market and governance conditions for deployment of TC on a large scale;
- Provide recommendations for additional measures which need to mitigate hindrance for sustainable adoption of IF;
- Develop governance processes for realisation of use cases in administrative training;

Contract No. H2020 – 730844

- Design a management structure;
- Develop a roadmap for a governance structure;
- Identify actors that interact with the governance structure in adoption, maintenance of technical tools, i.e. ontology repository, semantic web of technologies, registry and specifications;
- Provide efficiency in governance structure for open semantic technology standards and frameworks by making them more interoperable.

3.2 WHY GOVERNANCE IN INTEROPERABILITY FRAMEWORK

Governance of the Interoperability Framework helps to achieve multiple objectives for GO4FR and S2R projects. It helps to pave the way for long-term solutions for the adoption of sustainable urban transport services. Better governance in the context of the Interoperability framework helps to achieve better interoperability among TSP services. It yields following important advantages:

- Delivering value to the stakeholders by providing added value services, i.e. IT2Rail Travel companion
- Compliance with specifications, laws and standards as specified in other work packages for GO4FR
- Implement efficient management in S2R services
- Ensuring quality of services
- Managing the portfolio of services within TC: Includes planning, management, updating and development of current and new services
- Managing and improve current service style: Aims for an update of services and not disturbing current service consumers
- Monitoring performance of services and data analytics
- Managing how and by whom services will be operated through various stages of TC.

4. CONCLUSIONS

Previous two sections were devoted to outcomes from GOF4R D.2.1 Analysis of the demand of travellers for the TC and D2.2 Analysis of the demand of market actors for the Interoperability Framework. In order to create a sustainable system of IF governance, the needs and expectations of both passengers and market actors should be taken into account. Briefly, the main outcomes of the analysis of the users' needs are presented in Figure 3.

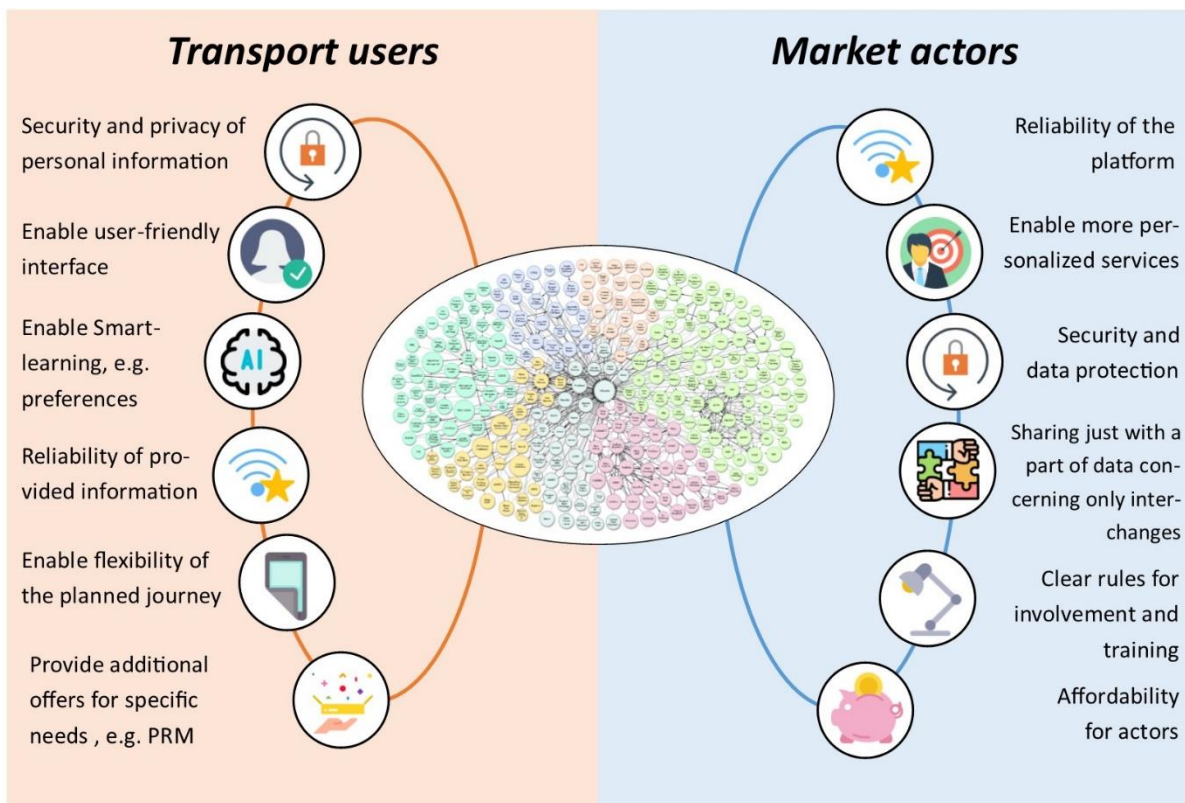


Figure 3: Main needs and expectations of users regarding the IF

This deliverable should be used as an input for WP5 Governance and management structure for interoperability framework in order to take into account initial expectations of the users.

It is important to highlight that the governance process of the IF should be considered not only from the perspective of management of the technical aspects but also include strategical aspects covering business, management and legal perspectives. Interests of multiple stakeholders involved in the platform, each with their own interests, rules of business etc., should be taken into account. Definition of rules, roles and tasks should be led by the EU institutions, it should help to overcome the lack of business cases, skills and issues with legacy systems. Together with the introduction of the IF, the tool for protection of business models and market positions of the operators due to open data sharing with other actors should be considered.

5. REFERENCES

GOF4R D2.1 Analysis of the demand of travellers for the TC (2018)

GOF4R D2.2 Analysis of the demand of market actors for the Interoperability Framework (2018)

IT2RAIL Grant agreement, annex 1: description of the action (2015)

IT2RAIL Newsletter (September 2016)

IT2RAIL D7.8 White paper on IP4 concepts end-user applicability (2017)

REGULATION (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

REGULATION (EU) 2017/1926 of 31 May 2017 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services Rights of passengers in multimodal transport: Inception Impact Assessment (DG move unit b.5, December 2016)

SHIFT2RAIL Master Plan (31 March 2015)

SHIFT2RAIL Multi-annual action plan (November 2015)