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1. Executive Summary

This document constitutes the Deliverable D5.4 Final report on Athens demonstration execution of the IP4MaaS Project (S2R-OC-IP4-01-2020, GA 101015492). Its aim is to describe all planning steps undertaken by the consortium to demonstrate IP4MaaS application in the capital of Greece, Athens, as well as present the actual demonstration and its results and lessons learned.

The journey planner that was demonstrated in a real corridor considers public transport, bike, pedestrian, and car routings to provide optimal means of traveling. The demo site is located within the urban area of Athens, including OASA, the Municipality of Iraklio (MIRAKLIO) acting as small PTO as well as Brainbox (bike-sharing) and Taxiway (ride-sharing). The Athens demo ran in two phases; the first started on 11th of July 2022 and lasted for 2 weeks while the second started on 27th of March 2023 for 1-week period.

In brief, both phases of demonstration in Athens included the following steps: selection of functionalities to be demonstrated, definition and deployment of the engagement strategy, performing of internal coordination and testing, conduction of a training session, and finally execution of the actual demo and evaluation of the results. It is worth noting that during the 2nd pilot richer functionalities were demonstrated.

The main challenges that were encountered during the 2 phases of the Athens demo are mainly related to technological and legal issues. In more detail, issues related to data protection, lack of open traffic data frameworks, and lack of interoperability among involved TSPs were faced. A variety of helpful tools and techniques were employed to overcome these obstacles, including the usage of QR codes, linking to other apps, and mobility package applications. Considering that these solutions were successful in the demo setting, they also demonstrate the importance of tackling MaaS issues to provide a competitive mobility service that is dependable, meets user needs, and increases accessibility for all users.

2. Abbreviations and acronyms

Abbreviation / Acronym	Description
CFM	Calls for Members
DL	Dissemination and exploitation leader
DoA	Description of the Action
EL	Ethical leader
EU	European Union
FS	Financial Statement
GA	Grant Agreement
H2020	Horizon 2020
IP4	Innovation Programme 4
OC	Open Call
PC	Project coordinator
PM	Project manager
PMO	Project Management Office
PMT	Project Management Team
PO	Project Officer
QAC	Quality Assurance Committee
S2R JU	Shift2Rail Joint Undertaking
TL	Technical leader
WP	Work Package
WPL	Work package leader

3. List of figures

4. List of tables

5. Background

The present document constitutes the Deliverable D5.4 “Final report on Athens demonstration execution” of the T5.4 “Athens demonstration” of the WP5 in the framework of the IP4MaaS project (GA 101015492, S2R-OC-IP4-01-2020) under the Innovation Programme 4 (IP4) of the Shift2Rail Joint Undertaking, executed in cooperation with Call for Members Consortia COHESIVE (GA 777599, S2R-CFM-IP4-02-2017), CONNECTIVE (GA 777522, S2R-CFM-IP4-01-2017) and ExtenSive (GA 101015462, S2R-CFM-IP4-01-2020) also being a part of the Shift2Rail Joint Undertaking and connected with the IP4MaaS Consortium by means of the Collaboration Agreement.

The results and conclusions of the Athens demo execution presented in this document will also contribute to T5.1 of the IP4MaaS project – “Coordination of the demonstrations executions” and corresponding D5.1 “Results of the demonstrations”. They contribute as well to WP6 D6.2 “Performance assessment”.

6. Objective/Aim

This document has been prepared to provide a thorough insight to the Athens demo site and specifically to the preparation actions, the actual execution of the Athens demonstration of the IP4MaaS application, as well as the results of the demo and the overall lessons learned from the testing of the first MaaS application in Athens.

More specifically, throughout this document the testing area and the goals of the demo are presented, along with the description of the coordination of all parties having a vital role in the demo execution (local partners, Transport Service Providers (TSPs), CFMs users, etc). Following, the functionalities selected to be tested are listed, the user engagement strategies explained and the division of tasks among the team explained.

Other issues dealt with in the framework of this document are the integration of the existing systems to the Travel Companion (TC), the internal testing phase after the integration and the training of the users.

Finally, information is provided on the actual execution, namely, statistics on the users, provided feedback and lessons learned. At this point it should be noted that, the Athens demo site was the **only** demo in the framework of the project that ran in two phases, while it was the demo to start first during the 2nd phase. The reason for this was because Athens was the only demo actually ready for a testing during the foreseen period. During the 2nd period however, several new functionalities were tested and this was also a reason to have two demo phases. Based on this, the information described above is provided for both phases, along with the lessons learned from the 1st to the 2nd phase.

7. General information about demonstration site

The Athens demo focuses on **enhancing multimodality by providing journey planning and integrated ticketing through a single application.** Journey planners combine several transport modes, including public and personal transport such as private cars, bikes, and walking. Although an extensive list of personal transport modes is not included within journey planners, mode-specific considerations are performed on the basis of available infrastructure (i.e., public transport lanes, bike, and pedestrian routes, and car routes). The journey planner that is demonstrated herein considers public transport, bike, pedestrian, and car routings to provide optimal means of traveling. Travelers may use other transport modes (e.g., electric skateboards, e-scooters, etc.) in the suggested routings by considering the regulations and traffic conditions of the region. The demo site is located within the urban area of Athens, including also a small Public Transport Operator (PTO), the Municipality of Iraklio (MIRAKLIO). The municipality is located 8.5 km from central Athens and directly provides PT services in its territory (Figure 1).

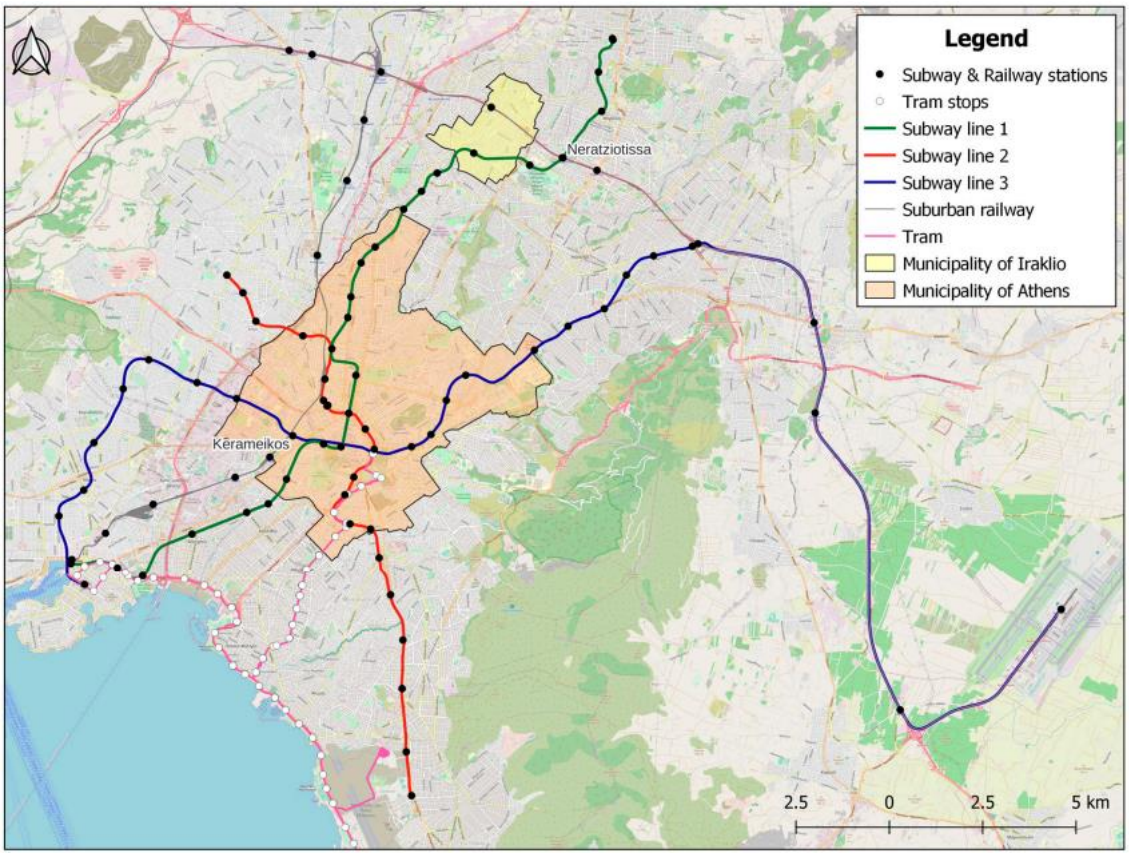

Figure 1: The Athens demo area

Attica is Greece's region with the highest inhabitancy rate, including the country's capital city, Athens. The Region of Attica covers an area of 3808 km^2, is home to a population of about 3,923,000, and is divided administratively into 113 Municipalities, while the municipality of Athens due to its large size is subdivided into seven districts. Attica's public transport network consists of

five different public transport modes: metro, suburban railway, tramway line, buses, and trolleybuses, which are run by different operators. The Athens Metro network is composed of three lines with 67 stations, and a total length of 85.3 km, transferring around 1,400,000 passengers/day.

Currently, the Public Urban Transport Organization of Athens (OASA) provides a reloadable card (i.e., ATH.ENA card), which may be topped up with multiple fare products depending on trip needs and affordability. This card can be used in all transport modes and operators belonging to the OASA network, namely buses, trams, trolleys, and metro (3 lines). The OASA telematics app allows the user to plan a journey using the metro and the tram starting and ending at two different stations, hence not covering the door-to-door part. The app also provides information about the exact time of the vehicle's (bus) arrival at the bus stop and the vehicle's position on the network. Alternatively, through Google Transit, a user can plan a journey using all modes of public transport and potential walking parts.

To further expand the use of ATH.ENA card within the demo, the OASA established cooperation with a taxi company and a bike-sharing service. In this way, travellers that need to use a taxi or a bike for the first and/or final part of their trip, may use the developed app to hail them.

The demonstration runs the proposed developments in a real corridor that has the potential to prepare the MaaS eco-system deployment and market uptake. The rationale for the corridor selection lies in the existence of multimodal transport for people on a daily basis and the lack of an optimal scheme of connections between them to improve the overall performance of the transportation system. Bike-sharing and ride-sharing with taxis have limited application in the area but they are the main drivers for new services provision at the level of the municipality and the wider agglomeration.

8. First pilot

8.1 Preparation phase

All preparatory activities were conducted in accordance with the Demonstration Execution Plan for the 1st phase of the demonstration (IP4MaaS project, 2021) which produced a detail plan for the C-REL demonstration in Athens. This plan set clear goals for its execution; established a timeline for the preparatory actions and the execution of the demonstration; identified demonstration-related risks and the appropriate responses (mitigation measures) to those respective risks; and set clear roles and responsibilities for all participating members and involved stakeholders. The Demonstration Execution Plan served as a road map for all involved entities, namely WP4 Leader, WP5 Leader, demo leader and TSPs for Athens, as well as all three committees of the IP4MaaS project (Data, Integration and Management Committee). Its aim was to ensure the successful execution of the Athens demonstration in July 2022 and the achievement of its goals.

As agreed with the complementary CFM projects COHESVE, CONNECTIVE, MaaSIVE and ExtenSive, C-REL focused on the Athens demo site, to make possible the overall scheduling of integration activities in the Shift2Rail IP4 ecosystem.

As a first step a filtering process was conducted, in order to determine which technologies would be finally demonstrated in Athens during the C-REL. This filtering process considered several factors, namely IP4 available Technologies, TSP available services, scenarios, demo site goals, demonstration iterations, availabilities, and integration constraints from both the TSPs' and the CFMs' sides. All those factors acted as "sieves" that gradually filtered the initial pool of technologies and ended up to the final ones that will be demonstrated. The final list of the functionalities to be demonstrated by the TSPs during the C-REL demonstration is included in the deliverable D4.2 "Demonstration Execution Plan C-REL." The services identified were then developed and further enhanced and all necessary data were provided to the CFMs for analysis and integration.

After this, the time schedule and the demonstration timeline were decided, in constant collaboration with the CFMs, in accordance with their complementary projects' timelines and the integration process.

The activities to be performed were separated in 6 phases:

1. Preparation phase
2. In-house development & Administrative tasks
3. Integration & Administrative tasks
4. Testing
5. Demo preparation
6. Demo execution

The six phases have been further discussed with our Call for Member partners, in order to adjust their start dates and duration. This resulted in a more realistic and feasible schedule both for the IP4 Consortium and the CFM partners. Each phase has been described in detail in the deliverable D4.2 Demonstration Execution Plan C-REL. The Athens C-REL timeline may also been seen in the following figure (Athens Demo Timeline (C-REL) (*Figure **2***).

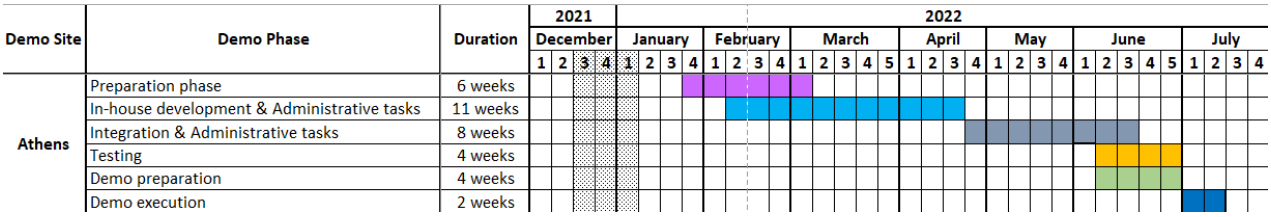

Figure 2: Athens Demo Timeline (C-REL)

In addition, more factors were taken into consideration, specifically the time restrictions presented to IP4MaaS, identified risks and certain chances to be enhanced that were expected to be encountered during the summer in Athens, limitations in resources and in the technical aspect, as well as the preparatory actions needed for the organisation of the demonstration and the engagement of users.

Therefore, through consultations, iterations and constant collaboration with all involved stakeholders (CFMs), the time schedule of the aforementioned phases and the demonstration execution timeline of the Athens C-REL demonstration have been further refined. It was decided that the 1st Demo Phase will be executed in Athens in parallel with the demonstrations of Ride2Rail project, between 11/07/2022 and 22/07/2022.

According to the CFMs' demo integration planning, since the requirements had been fulfilled (data, API and any other documentations) for each component from the side of all three participating TSPs, the following actions were conducted, in order to ensure that all proper actions have been taken, all tests have been conducted and the final functionalities to be demonstrated have been successfully integrated, are functional and provide utilizable solutions to the end users (travellers):

- Analysis and conclusion of the integration process required 3 to 4 weeks in total.
  According to the plan the integration process was concluded:
  - for Brainbox Issuing and Taxiway Booking, during the first week of June, then Indra conducted the appropriate tests,
  - for OASA, Brainbox and Taxiway the shopping component's integration was concluded at the end of first week of June 2022, then Indra conducted the tests for 2 weeks.
- Until the end of June 2022, the last tests were conducted from the CFMs' side and then OC tests (tests from the open calls) followed, prior to disseminating information and the final application to the engaged users.

After internal discussions, discussions with all CFMs and technical partners and after taking CFMs analysis into account, it was decided to postpone the participation of MIRAKLIO (Journey Planner - Shopping), the service of Issuing for OASA and Taxiway, as well as the Validation service for Taxiway. This was decided in order for the CFMs to integrate the already developed functionalities in time for the conduction of the demonstration. During the 1st phase demonstration was decided to demonstrate only the Location Based Experiences (LBE) for MIRAKLIO along its bus route.

After ensuring that the Athens demo site was a consolidated situation, test cases were compiled by the Athens demo actors in order to provide to the CFMs and assist in the conduction of the testing of the technologies prior to the demonstration in July 2022. The test cases were scenarios of door-to-door transport, as close to reality as possible, entailing all involved TSPs and every involved mode of transport the TSPs provide, as well as specific details such as starting point and destination point, each station/stop of interchange, date and time of departure, time of arrival of the traveller, distances to be covered on foot by the traveller to reach each point/mode. Thus, the CFMs were in the position to conduct tests and assess the success of integration of the functionalities (Pass/fail status).

The Integration Committee, in order to monitor the integration progress and facilitate the dissemination of information to all involved partners, has compiled an IP4MaaS IP4 Functionalities Matrix, where the respective functionalities have been listed, along with their status. The Matrix has been constantly updated, in accordance with the latest developments of the functionalities and the progress of each demo site's TSP and demo leader. All latest developments have been provided from the Integration Committee, as per the role described in the IP4MaaS project, Deliverable D4.2 Demonstration Execution Plan, C-REL (2021) and on the D4.5 Report on Integration, Data and Management Committees activities (2023).

Moreover, all necessary GTFS data, APIs, documentations, credentials have been provided to the Integration Committee, which has uploaded them into the Asset Manager, in order to facilitate the exchange of information between the operators and the CFMs. More information can also be found in the IP4MaaS project, Deliverable D 4.1 Technology Integration Plan, C-REL (2021).

Meanwhile, questionnaires for both travellers and TSPs were created in WP3 and then, after review and finalisation, were translated into the local language (Greek) by the demo leader CERTH, for the travellers and TSPs to fill it. Those were the user satisfaction surveys (User Satisfaction Index, USI questionnaires, created under Task 3.2). The purpose of the said surveys was to be disseminated during and after the end of the demonstration and provide information necessary for the assessment of the users' satisfaction. IP4MaaS made use of certain KPIs from D4.1 of Shift2MaaS' respective list for the evaluation from strategic, technical and exploitation point of view of the IP4 functionalities (see also (IP4MaaS project, Deliverable D 3.2 List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, F-REL, 2022)). IP4MaaS also included KPIs that are valid to measure the gain/benefit of IP4 functionalities offered by TSPs from operational and performance point of view. Some other KPIs listed in Shift2MaaS were considered by the Consortium in USI questionnaires. KPIs are validated in an iterative process, involving demo leaders and responsible partners of the assessment.

In parallel WP3 introduced the appropriate quantifiable Key Performance Indicators (KPIs) which were verified by the CFMs. KPIs were provided and described in detail in the respective plan for the C-REL demonstration (IP4MaaS project, Deliverable D4.2 Demonstration Execution Plan, C-REL, 2021) and corresponded to the respective functionalities that were planned to be demonstrated in Athens in July 2022. All actions were conducted in collaboration with and with assistance from the Data Committee, as per its role and responsibilities that are defined in the respective C-REL plan (IP4MaaS project, Deliverable D4.2 Demonstration Execution Plan, C-REL, 2021).

As per risks related to the Athens C-REL demonstration and the appropriate mitigation measures, the Demonstration Execution plan created a preliminary but nevertheless extensive list of identified risks, mitigation measures and contingency plans. The objective of risk management is to reduce the probability and the impact of threats towards achieving pilots' results, and in the respective deliverable (D4.2) a specific chapter has been dedicated for outlining how risk management activities may be performed, recorded and monitored, and by who, specifically concerning the specific scope of the demonstration execution.

8.1.1 Demonstrated functionalities

The list of the functionalities demonstrated in the Athens demo site phase I are described below:

For TSPs:

1. Asset manager: The platform which provides and describes the services, and facilities in the IP4 platform and identifies the integration of these services into the IP4 ecosystem.
2. LBE editor: The tool that allows building Location-Based Experiences for the user.

For travellers:

1. Journey planning function: The function which allows travellers to find routes involving different modes of transport and calculates multimodal routes from origin to destination. These routes can include offers price calculation.
2. Booking function: The function which allows the traveller to reserve and purchase both a specific ticket and multimodal tickets that allow travellers to travel on multiple forms of transport such as metro, buses, and trains.
3. Issuing function: The function which provides online tickets that can be used, validated, and inspected through the TC mobile application.
4. Location-based experience (LBE) function: The function which provides the traveller the opportunity to discover entertainment services, such as quiz games or commercial offers provided during the trip.

8.1.2 User engagement strategy

A user engagement strategy was created in order to engage travellers into making use of the Travel Companion application, utilising its functionalities and filling the aforementioned surveys. Athens demo members participated in specific User Engagement Strategy workshops organised by AITEC

beforehand, in order to define a specific strategy for the C-REL Athens demonstration. The respective IP4MaaS Deliverable (IP4MaaS project, Deliverable 4.4 User Engagement Strategy per each demonstrator, 2022) defines the said strategy, to engage both locals and tourists in July 2022 in Athens and served as a roadmap for all Athens demo members to coordinate and organise the engagement of users as well as the promotion of the demonstration, prior and during its execution.

The engagement strategy included the following actions:

1.Distribution of brochures:

- 500 at the Greek Organization of Tourism
- 500 at the City of Athens Organization
- 3500 at the Organization for road transport

2. Setting up of posters and banners (in English and Greek) in more than 10 stations including the airport and the port of Piraeus (*Figure **3***, *Figure **4***).

Figure 3: Posters were set up at main stations in Athens

Figure 4: IP4MaaS poster

3. Posts through the social media of all local partners, plus coordinator and EU pages
4. Posts at companies' websites
5. Internal communication using emails of CERTH's employees.

Finally, as an incentive the users that participated at the demo and completed the survey, took part in a lottery giving out free tickets for public transport modes, up to 27€ for any destination, within the service area of OASA, by using all available transport modes.

8.1.3 Internal coordination

Throughout the preparatory actions and processes for the C-REL demonstration in Athens, as per the D4.2 Demonstration Execution Plan C-REL, all involved entities had specific roles and responsibilities. In general:

- The **Integration Committee** monitored the progress of the technology integration plan in collaboration with CFM projects.
- The **Data Committee** had two main goals. First, it was responsible for handling data exchanges between IP4MaaS TSPs and CFM projects in the scope of integration and demo activities. Second, it was responsible for the data collection during demos to feed the assessment pillar.

- The **Management Committee** was responsible for managing and coordinating actions of the demos, acting on behalf of the project board for low-level decision actions (time-sensitive decision making).
- The **CFMs** were responsible for communicating their requirements to the TSPs, demo leaders and committees; exchanging data with TSPs; participating in workshops and providing the necessary trainings on the use of the functionalities; executing development and integration tasks; supporting the resolution of integration issues; and delivering the latest version of the Travel Companion application.
- The **TSPs** were responsible for providing the requested information, data etc.; exchanging data with CFMs, the committees and demo leader; participating in workshops; executing developing tasks; providing sufficient documentation, data and APIs; providing feedback; engaging partners for the demonstration as per the actions determined in the user engagement strategy; and supporting the demonstration execution.
- The **demo leader** monitored and controlled all preparatory actions in regard to Athens demo site; facilitated all communications between TSPs and CFMs; acted as a link and provided all necessary information to CFMs and the committees; coordinated actions within the demo site; provided information and feedback to the committees to be shared across all demo sites; identified and resolved issues within demo sites; handled all engaged users' registrations; and disseminated e-mails with materials and links to the app, as well as the terms and conditions, user guide, surveys and additional information to the engaged users.
- **WP4 Leader** was responsible for monitoring the operation of the committees; participating in workshops; facilitating the exchanging of data; and receiving input and updates to keep all demonstration execution plans, both for C-REL and F-REL up to date.
- **WP5 Leader** was responsible for coordinating on a technical and organisational level the demonstration execution; monitoring the development, integration and testing tasks; organising the demonstration execution; organising meetings with PTOs and TSPs and gathering their feedback and updates; troubleshooting issues so that the IP4 Ecosystem IT tools can be used properly; ensuring the proper implementation of the plan; informing CFMs about limitations, barrier and/or constraints of each TSP; and defining and implementing data sharing schemes between CFMs and TSPs.

The coordination of all the above entities was mainly done through numerous calls that took place throughout the whole period of the demo planning and execution. Due to COVID-19 physical meetings were very limited; however, in the case that those occurred, the above-mentioned parties took advantage of them for further coordination.

Once the planning got close to the actual demonstration, the WP5 leader created a check list that should be completed before the execution of the demo (*Figure **5***).

Check-list - Athens demo site					
Task	Priority	Deadline	Status	Responsible partner	Comment
To create mailing list with one/more contact person(s) per demo site (OCs and CFMs)					
To determine person, who will be reponsible for communication with testers during the pilot execution					
To create issue log for internal testing (ensure communication between OCs and CFMs partners regarding DC & TC apps if any issues occur during the internal testing)					
To prepare test cases for CFMs					
To have confirmed (from CFMs side) that test cases have been performed successfully					
To have links for DC (Driver Companion) & TC (Travel Companion) apps					
To test (internal) DC & TC apps					
To implement issue log (if it necessary)					
To close all recorded issues (issue log)					
To prepare materials for testers to ensure seamless pilot execution (shor description of project(s), tutorial video, instructions, report template, ...)					
To determine the final version of incentives					
To translate the questionnaire and other documentation for testers					
To address possible testers through the identified channels					
To select and address testers					
To have list of testers					
To distribute questionnaire (before the pilot testing - GDPR Compliant)					
To distribute instructions, links for DC & TC apps, DC & TC User guides and other materials prepared for testers					
To distribute questionnaire and incentives (after the pilot execution)					

Figure 5: Check-list – Athens demo site

All the involved parties met once a month and on a biweekly basis as the demo approached in order to go through the above check list and identify next steps, potential problems and related contingency plans.

8.1.4 Internal testing

There have been limited technical issues deriving from the integration requirements, that have been resolved in due time. A few of those were concerning the integration with Brain box API for the bike sharing but the errors were fixed without major delays.

However, most of the issues risen during the 1st phase had to do with the adaptation of the functional characteristics of the services, for example, how to handle no-show customers who have booked a taxi etc.

8.1.5 Training session

In order to ensure the successful execution of the 1st phase (C-REL) demonstration in Athens, first of all the proper engagement of the TSPs needed to be ensured. That way their active support could be acquired, not only for the preparatory phase of the demonstration, but also for the duration and after its completion, so the TSPs may become familiar with the functionalities, for the surveys targeted to TSPs may be properly filled in and the respective satisfaction index to be calculated, which is essential for the holistic calculation of the Effectiveness rate and thus assessing the demonstration in the context of WP6.

For that purpose, a series of meetings with the CFMs were held, with other members of the IP4MaaS consortium being present, such as the WP4 Leader, the WP5 Leader and the Committees Leaders, to ensure smooth and seamless exchange of information and knowledge to all other demo sites as well. The meetings are listed below:

- Integration Meeting on Location Based Experiences for Athens demo, a meeting conducted on 31/01/2022;
- RIDE2RAIL/IP4MaaS joint informal Collaboration Meeting, conducted on 10/02/2022;
- Location Based Experiences Meeting with CFMs and all Athens demo partners (demo leader and TSPs), conducted on 23/03/2022;
- Collaboration Meeting with CFMs on Asset Manager, Functionalities, Test cases, conducted on 05/05/2022;
- IT-Trans Stakeholders Workshop for Ride2Rail and IP4MaaS in Karlsruhe, where the planning of all demonstrations, as well as the work conducted so far and the upcoming demonstrations were communicated to stakeholders, conducted on12/05/2022;
- Test Strategy for the Location Based Experiences in Athens meeting with the CFMs, to showcase the application and the LBEs to be created, conducted on 09/06/2022;
- Location Based Experiences Second Meeting with CFMs, about tests on the LBEs, findings, provision of feedback from the TSPs' side, discussion on next steps, conducted on 16/06/2022;

Apart from all the aforementioned meetings with the CFMs, channels of communication with CFMs were maintained at all times, in order to ensure that both sides, namely the Athens demo partners (demo leader and TSPs) and the CFMs, were kept well updated and informed about any changes ensuring that both have full comprehension of how the final application and its functionalities will look and work. Constant communication was also maintained to ensure the timely preparation of all necessary elements for the promotion of the upcoming demonstration to the general public, entailing both tourists and locals (material such as posters, posts for social media and websites, e-mails etc.), the necessary terms and conditions for usage of the app, the accompanying user guide and of course the final version of the Travel Companion app.

On 08/02/2022 a User Engagement Strategy Meeting was held in particular for Athens demo site, prior to the finalisation of the respective deliverable D4.4. In this meeting all Athens demo members were present, in order to discuss the user engagement strategy, the number of users required, as well as possible newly identified risks.

Multiple internal (among Athens demo partners) meetings were held prior to the demonstration, as well as multiple other channels of communication utilised, in order for all Athens partners (AETHON, CERTH, OASA, Brainbox, Taxiway, MIRAKLIO) to properly coordinate, collaborate and promote the demonstration to users with clarity. All partners collaborated in creating promotional material, with OASA undertaking the task of creating artwork for posters, and each Athens demo site partner undertook the task of disseminating the created material to public spaces (such as announcements on the websites, posters on stations, social media posts) and communicating the demonstration, the incentives and the benefits of partaking in the demonstration to the potential users, locals and tourists alike. The demo leader monitored and coordinated all activities, while also worked intensively on preparing all download links for the Travel Companion and the LBEs, texts and e-mail templates that were to be disseminated to engaged registered users, in order to ensure that all information was user-friendly, easily understandable, accessible and GDPR

compliant.

Furthermore, during and after the execution of the demonstration the demo leader disseminated 4 times all surveys to TSPs and travellers, in order to acquire answers that will serve as data for the assessment of the demonstration in WP6, as per the methodological framework defined in WP3 (IP4MaaS project, Deliverable D3.1 List of operational KPIs, analysis of the users' satisfaction and methodology, C-REL, 2021).

8.2 Demo execution

As mentioned in previous sections, the demo site was located within the Athens agglomeration and focuses on central metro stations and inter-urban rail where multiple modes are available. Although multiple transport modes operate in the area, there is limited connectivity at the level of the networks and the services to support both daily commuters and tourists. In summary, the involved PTOs and the TSPs in the IP4MaaS Athens demonstration site are:

1. OASA: is the responsible authority for planning, coordinating, and financing the public transport system in the Athens metropolitan area, covering buses, trams, trolleys and metro (3 lines);
2. MIRAKLIO: is the public transport operator responsible for the buses operating within the Municipality of Iraklio, Attica;
3. BRAINBOX: is a company offering bike and car-sharing services;
4. TAXIWAY: is a company providing taxi services.

The main objective of this demonstration scenario is to enhance multimodality by providing integrated services, including different TSPs, through a single application that can be used by tourists and commuters. For the Athens demo, three travel cases were planned:

• Case 1: Multimodal work trip—From central Athens to any other metro station outside the central area (e.g., Keramikos station—any metro station);
• Case 2: MaaS for tourists—From Piraeus Port to any other metro station (e.g., Port–Keramikos station), for work trips and tourist arrivals;
• Case 3: Interurban/urban interfaces—From central Athens to any other metro station or site (e.g., Keramikos station—Neratziotisa station), for work and shopping/leisure trips.

The Athens demo was launched on the 11th of July 2022, and focused on enhancing multimodality by providing journey planning and integrated ticketing through a single Travel Companion application. Over the course of two weeks, real travellers used the Travel Companion app during their journeys, and they were asked to fulfil a survey afterward, sharing their experiences. The app enabled the MaaS implementation for the selected high-level journeys and different user categories. The travel experience that was enabled is each trip is shown in *Figure **6***.

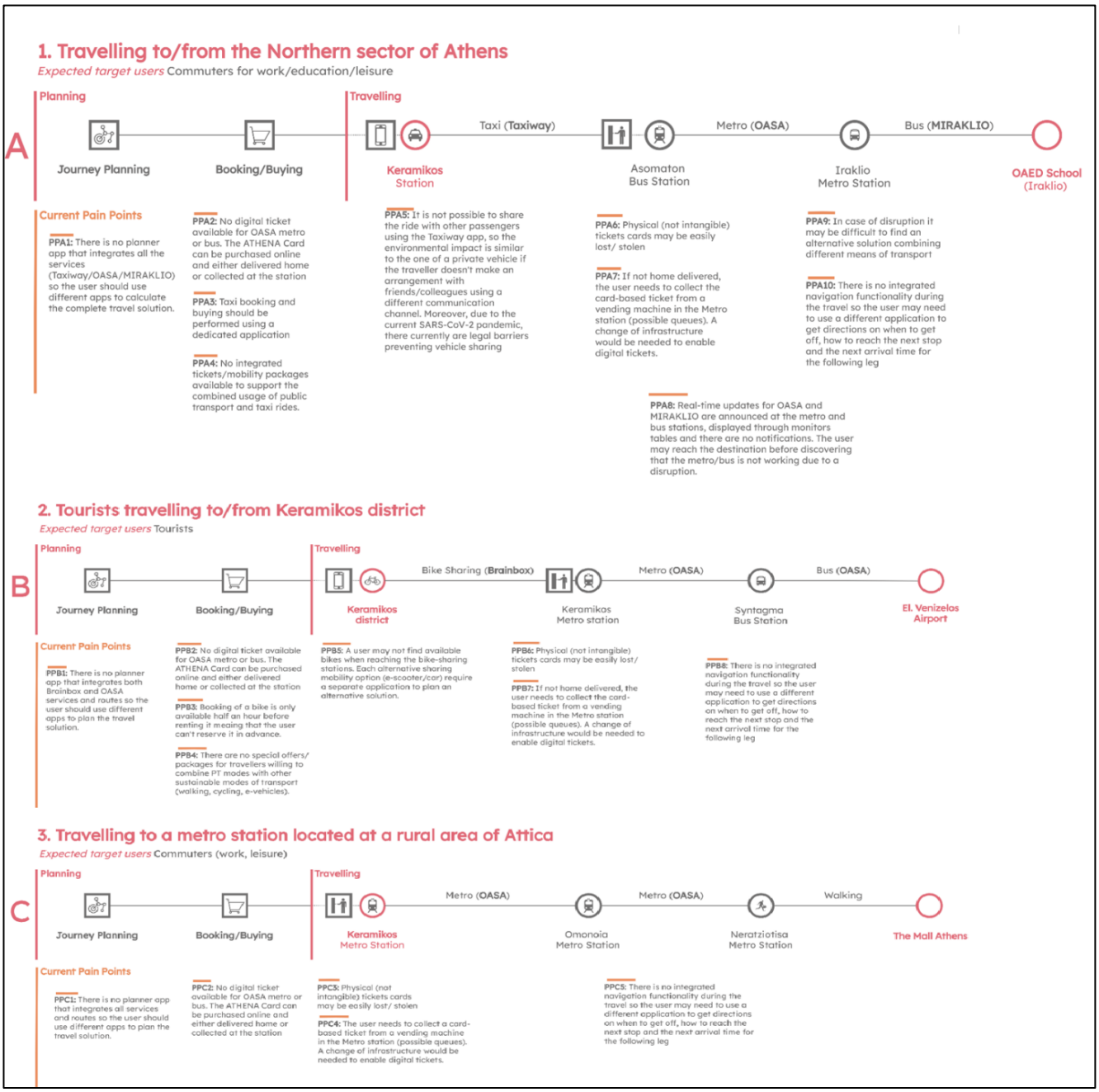

Figure 6: Athens user journey map

Once the demo was officially launched, 140 users were registered to participate. The functionalities that were tested include the journey planner for the whole Attica Region, bike issuing, taxi booking, and Location Based Experiences (LBE). Out of the 140 users, only 12 removed their consent, while 32 of them registered as users of the BRAINBOX (bike sharing) app and 15 actually rented a bike. About 57% of testers were 25–44 years old and 43% were 45–64 years old, while 57% of all testers were female and 43% male.

By the completion of the demo, the participants received an email urging them to complete a

survey that aimed to assess their satisfaction when using the TC. Through this survey, participants were asked to rate the functionalities of the app in terms of cost and time efficiency, planning process and overall satisfaction level, and the possibility of using more the PT. The email was sent several times as a reminder to participants to take the survey, resulting in 17 responses.

The number of users that participated in the demo application in Athens was as high as 140, while the number of users that completed the survey was 17. This results in a response rate of 12%.

8.3 Technical and business barriers regarding the sample size for the USI calculation in phase I

Achieving a sufficient responses sample size for different socio-demographic profiles has a high significance in the results of data analysis for this study. Overall, in this assessment, five types of profiles were studied and for these five profiles the following statistics were collected:

r=1 All profiles regarding aggregated analysis: 17 respondents.
r=2 Unemployed people, low-income people, retired people, students: 2 respondents.
r=3 Disabled or impaired people-people with physical or mental illnesses, person in a wheelchair, person with reduced mobility, person with visual impairment, person with hearing impairment: 0 respondents.
r=4 Elderly-People over 65 years old: 0 respondents.
r=5 Women: 4 respondents.

As it can be seen, considering the limited and insufficient number of responses in the Athens demo site phase I, the participation of specific (sensitive) profiles (r=2, 3, 4, 5) was low. This insufficient participation decreased the accuracy of the impacts in the assessment phase. D6.2 "Tool for performance assessment" reports some information on the required sample size for each module of Regression analysis, Bayesian Network analysis, and ANOVA test. These sample sizes (for both general and specific profiles), as described in D6.2, allow to have an accurate and more precise outcome in case of data analysis, minimizing the risk of poor/less significant results in the "USI travellers and USI TSPs" calculation described and presented as outcome of WP3.

8.4 Data sharing agreement with CFMs regarding operational KPIs in phase I

One of the main inputs for the calculation of "Effectiveness" that has been defined in WP3 was the operational KPIs. Concerning the IP4MaaS functionalities, the WP3 leader created an Excel sheet and requested from CFMs to provide at least one operational KPI for each functionality that can be collected during the assessment of each demo. After the execution of the Athens demo site

phase I, the list and relevant values of operational KPIs linked to the functionalities were obtained. The list of operational KPIs, relevant functionalities, and responsible partners from the CFMs side is shown in the following table:

Table 1: List of operational KPIs assessed in Athens' demo site phase I

Number	Innovative Technology (IP4)	Operational KPI	Responsible partner
1	Location-Based Experience	Number of entertainment services offered during the demo	CS Group
1	Location-Based Experience	Number of experiences launched during the demo	CS Group
1	Location-Based Experience	Average time per connection (in seconds) during the demo	CS Group
1	Location-Based Experience	Total number of connections in the morning	CS Group
1	Location-Based Experience	Total number of connections in the evening	CS Group
2	Asset manager	Number of services integrated with the pilot	POLIMI
3	Journey Planning	Average Number of modes involved in the journey	Extracted through USI surveys
3	Journey Planning	Average number of shopped offers	THALES group
4	Booking	Average number of booked offers	THALES group
5	Issuing	Average number of issued offers	THALES group

It should be noted that considering the methodological framework of the IP4MaaS project, each functionality (innovative technology) can have one or more operational KPIs.

8.5 Data sharing agreement regarding the ethical application form (information on the legacy system) in phase I

Prior to the execution of the Athens demo site phase I, an ethical application form was prepared by AITEC and approved by IP4MaaS ethics board members. In this ethics application form different ethical issues were explained. The ethics application form consisted of four main sections: SECTION A: Applicant details, SECTION B: Data collection campaign details, SECTION C: Research involving human participants, and SECTION D: Data protection, copyright, and other considerations. Regarding the phase of data collection and data processing, one of the most significant parts was the "Participant information and consent sheet" known as "terms and conditions" in USI surveys. The participation of respondents to the USI questionnaire was entirely voluntary and the survey was done and completed anonymously. According to this, no personal data was collected and in relation to data removal, the email of the Athens demo site leader was dedicated in the form, so respondents are able to ask demo leaders for data removal giving them the required information (date and time they completed the survey). Following this request, demo leaders will ask AITEC and FIT to remove that specific data from the results.

8.6 Evaluation of phase I

After the execution of the C-REL demonstration, the following statistics were extracted by the Athens demo leader:

- Number of registered users: 140.
- Number of users that removed consent: 12.
- Responses (filled in questionnaires) received from TSPs: 7.
- Responses (filled in questionnaires) received from travelers (Greek): 7.
- Responses (filled in Questionnaires) received from travelers (English): 10.
- Number of calls for taxi: 3.
- Number of taxi rides fulfilled: 0 (no driver ever found the passenger).
- Number of bike coupons calls (via TC app): 49.
- Number Registered Users at the BRAINBOX app: 32.
- Bike Rentals: 15.

The USI questionnaires that were disseminated and filled in by TSPs and travelers were compiled in the context of WP3 and can be found in the (IP4MaaS project, Deliverable D3.1 List of operational KPIs, analysis of the users' satisfaction and methodology, C-REL, 2021) compiled by AITEC.

In addition, after evaluating the users' feedback from both the TSPs' and users' side, the following Lessons Learned were extracted and presented to the whole consortium and the CFMs, to serve as a reference to the rest of the demonstrations (including F-REL Athens), improve the application

and its solutions, provide suggestions that all partners can build upon and thus add value to future projects and endeavors of a similar nature:

Lessons Learned regarding testing:

- One-week internal testing poses the risk of being inadequate to test all features and solutions extensively, the suggestion was that the timeline and thus all partners planned works and endeavors should also calculate in some additional time. That way a fully functional version of the app may be provided to the users and thus raising the success rate of the demonstration, as well as the satisfaction of the users in the end.
- Following the previous point, another user engagement approach was suggested, that of a soft opening adoption, which would entail:
    - 1 week of stress testing: limited only to a closed, specific group of users (max. 10), for the purpose of detecting bugs, fixing them and optimizing the user experience (UX);
    - 1 week of soft opening: limited to a wider audience (between 20-40 users), involving enhanced disclaimer, enhanced incentives and thus ensuring procedural optimization;
    - 1 week of regular opening (demonstration): testing of the final application by a wide audience with normal disclaimer and incentives;
    - 1 week of post-demo survey conduction, during which a focus group would provide their feedback regarding procedures.

Lessons Learned regarding roles and responsibilities:

- Clear roles and responsibilities, as stated in the Demonstration Execution Plan is a necessary element. It was also suggested that a limited number of persons directly involved with all preparatory activities would be ideal, thus reducing response times and ensuring easier monitoring and controlling of the demo's situation from the demo leader's side.
- Vacation periods such as summer, Easter, Christmas holidays etc. should be avoided for the execution of demonstrations, since key people may be absent during those crucial days.

Lessons Learned regarding the application and other material:

- In order to ensure high level of users' engagement, ease of installation and usage of the application and its features and to avoid turmoil, misunderstandings or any possible frustrations from the side of the travelers, it was suggested that all material should be included in one single download, and shared via one single link.
- In addition, it was suggested that preferably all apps (Travel Companion, Location Based Experiences) should be incorporated in one single application. That would be quite more user-friendly and thus more appealing to the travelers to try in future demonstrations. In

Athens, users had to download the tools separately and then open the LBE functionality via the Travel Companion, this impacted their experience.

- Future versions of the Travel Companion should show customized information (addresses, POIs) to each location, as well as rides and means of transport in accordance with the selections the users make.
- The guidelines provided to the users can and need further refinement, in order to be easier to read and less technical, regardless of the background of the users.
- The registration e-mails, as well as any other e-mails sent to the engaged users need to be kept simple, comprehensible, and as 'light' as possible in order to keep the users motivated and eager to proceed with the installation and usage of the application, as well as to keep the whole process seamless, smooth and as less time-consuming as possible for the users.
- The repetitive selection of the bike through the application by the same user was a challenge, due to the fact that Brainbox has its own application to provide coupons to the users. A suggestion is future Travel Companion versions to be able to integrate such apps, to achieve seamless usage and transactions.
- The Travel Companion application should also present clear routes to the bike user and be informed which legs involve the bike and which are pedestrian trip legs, thus ensuring the safety of the traveller.

Lessons Learned regarding translations and surveys:

- For each demo site the demo leaders need to decide whether all documents may be translated into the native language or none of them, in order to have consistency in the material that will be provided to the users.
- The same applies to the USI questionnaires and the Travel Companion itself; it was suggested that the application should be translated fully into other languages and not just fragments of it.
- Local names such as POIs (Points of Interest), names of stations etc. should also be in the native language, therefore the locals may find it even easier to use the application.
- It was also suggested that the users should receive the surveys right after the end of the demonstration via e-mail. That way the mail would serve as a reminder. It was noticed that right after the dissemination of the respective e-mail numerous users would almost immediately access the survey and complete it, thus providing their valuable feedback for the assessment of the demonstration and the solutions tested during that time.

9. Second demo

9.1 Preparation

The preparation procedure during the 2nd phase followed the same steps as during the 1st phase.

9.1.1 Demonstrated functionalities

The 2nd phase of the Athens' demo had much richer functionality and furthermore covered not only mobile applications but also web applications for end users and TSPs. More particularly:

The following is the extended functionality for End users through the travel companion mobile app:

1. Journey Planner (JP)/ Offer Builder (same as in 1st pilot's phase)
2. Booking (same as in 1st pilot's phase)
3. Issuing (additionally to the 1st phase, issuing of QR code-based tickets for taxis and OASA – not meant for on trip validation though)
4. Mobility packages (the user is able of purchasing 10+1 free OASA tickets plus 3 free taxi rides)
5. Location-based experience (same as in 1st pilot's phase)
6. Navigation
7. Traveller's feedback
8. Trip sharing
9. Guest user
10. Preferences and profiles
11. Specific messages
12. Smart Locations
13. Map Content

On top, the Travel companion was available through Web-Portal with some of the above-mentioned functionalities (except Location-based experience, Navigation, Specific messages).

The following is the extended functionality for TSPs:

14. Asset manager
15. LBE editor
16. Contractual management marketplace
17. Travellers Orchestration and supervision (new use case with taxi pick up)

Table 2: Demonstrated functionalities in the Athens demo site phase II

Name of the demo site	Name of TSP (K) integrated with each demo site	Name of functionalities (J) assessed in each TSP (K) for travellers	Name of functionalities (J) assessed in each TSP (K) for TSPs
Athens	OASA	Travel companion Web-Portal (J=16), Guest user (J=12), Preferences and Profiles (J=13), Journey planning (J=1), Intermodal Fare Optimization (J=17), Issuing (J=3), Mobility packages (J=4), Validation and Inspection (J=5), Navigation (J=9), LBE (J=8) , Map Content (J=19) , Traveller's feedback (J=10), Smart locations, Trip sharing	Asset manager (J=23), LBE editor (J=24), Travellers, Contractual management Market Place (CMMP) (J=25), Orchestration and supervision (J=29), Specific messages (J=33), Distributed Ledger – Transaction Anchoring (J=30), Distributed Ledger – TSP Inclusion (J=31)
	MIRAKLIO	Travel companion Web-Portal (J=16), Guest user (J=12) , Preferences, and Profiles (J=13), Journey planning (J=1), Navigation (J=9), LBE (J=8), Map Content (J=19), Traveller's feedback (J=10) , Smart locations, Trip sharing	Asset manager (J=23), LBE editor (J=24), Travellers Orchestration and supervision (J=29), Specific messages (J=33), Distributed Ledger – Transaction Anchoring (J=30), Distributed Ledger – TSP Inclusion (J=31)
	Brainbox	Travel companion Web-Portal (J=16), Guest user (J=12), Preferences and Profiles (J=13), Journey planning (J=1), Intermodal Fare Optimization (J=17), Issuing (J=3), Mobility packages (J=4), Validation and Inspection (J=5), Navigation (J=9), LBE (J=8), Map Content (J=19), Traveller's feedback (J=10) , Smart locations, Trip sharing	Asset manager (J=23), Contractual management Market Place (CMMP) (J=25), LBE editor (J=24), Travellers Orchestration and supervision (J=29), Specific messages (J=33), Distributed Ledger – Transaction Anchoring (J=30), Distributed Ledger – TSP Inclusion (J=31)
	Taxiway	Travel companion Web-Portal (J=16), Guest user (J=12) , Preferences and Profiles (J=13), Journey planning (J=1), Intermodal Fare Optimization (J=17), Booking (J=2), Issuing (J=3), Mobility packages (J=4), Validation and Inspection (J=5) , Navigation (J=9), LBE (J=8), Map Content (J=19), Traveller's feedback (J=10) , Smart locations, Trip sharing	

9.1.2 User engagement strategy

The number of travellers per functionality and TSP should be similar to allow fair comparisons of the Effectiveness among TSPs and functionalities. In this context, the user engagement strategy managed by the Athens demo leader in cooperation with the TSP tried to achieve a similar number of travellers answering the USI questionnaire per each functionality and TSP. Travellers were initially selected randomly to allow the sample follows a normal statistical distribution, the same as the general population. Afterward, some specific profiles were encouraged to fill the USI to have a good representation for specific profiles: (r=2) Unemployed people, low-income people, retired people, and students. (r=3) Disabled or impaired people-people with physical or mental

illnesses, a person on a wheelchair, a person with reduced mobility, a person with visual impairment, a person with hearing impairment, and an Elderly. (r=4) Elderly. (r=5) Women. This was monitored in the middle of each demo by AITEC, and AITEC communicated to the demo leader in case of any lack of data for a specific profile "r" to react in time during the demo.

According to IP4MaaS project, Deliverable 4.4 User Engagement Strategy per each demonstrator (2022), for the Athens demo site demo leaders have promoted participation in the Athens demo by Provision of vouchers for 270 €.

Since data collection is based on filling out a digital survey about satisfaction regarding digital solutions applied to rail transport, there is a risk to get biased results focused only on people with high digital skills. Blind people will be also discriminated from the study. Finally, people below 18 years old or with any mental impairment who require a tutor will be also excluded from this data collection campaign. These ethical issues are issues intrinsic to the study without any possibility to mitigate them. They will be considered as limitations of the assessment. Advertisements and engagement strategies don´t present any ethics issues.

9.1.3 Internal coordination

The procedures followed during the second phase of the Athens demo were the same as during the first. The relevant check list was prepared once again, only this time it included steps and actions related to the functionalities to be tested during the 2nd phase (Figure 7).

Check-list - Athens demo site 27.03.-31.03.2023

	Task	Priority	Deadline	Status	Responsible partner	Comment
1	To prepare test cases for CFMs	High		Completed		
2	To confirm the final list of functionalities to be demonstrated	High		Completed		
3	TC translation and multilanguage (Greek)	High		Completed		
4	To determine the final version of user engagement strategy					
5	To have access to the Mantis (contact Matthias Walter matthias.walter@hacon.de)					
6	To have fake credentials for TC app					
7	To test registration of fake credentials in TC app					
8	To prepare materials for testers to ensure seamless pilot execution (short description of project(s), poster, tutorial video, instructions, ...)					
9	To have final version of USI survey					
10	To have final version of TC user guide					
11	To have final version of Terms & Conditions					
12	To translate the USI survey and other documentation for testers (TC user guide, T & C TC, etc.)					
13	To have link for TC (Travel Companion) app					
14	To perform the internal testing of TC app					
15	To insert identified issues to the Mantis (if it is necessary)					
16	To close all recorded issues (Mantis)					
17	To distribute instructions, link for TC app, T & C, TC User guides and other materials prepared for testers (by e-mail)					
18	To organize an engagement online event					
19	To distribute USI survey (after the pilot execution)					
20	To distribute incentives (10+1 tickets)					

Figure 7: Check-list – Athens demo site – 2nd phase

9.1.4 Internal testing

There have been limited technical issues deriving from the integration requirements, that have been resolved in due time, also taking advantage of the previous experiences.

9.1.5 Training session

As conducted also for the C-REL demonstration, in order to ensure the successful execution of the 2nd phase (F-REL) demonstration in Athens, actions were taken to engage all the involved TSPs, namely OASA, Taxiway, Brainbox and MIRAKLIO. Multiple meetings with the CFMs were organised throughout the preparation phase, in order to provide information and demos of the Travel Companion application and the functionalities to be demonstrated during the F-REL demonstration. These meetings aimed at familiarising all involved entities with the solutions to be tested by them, utilize them properly, assess potential benefits and provide their feedback via the respective questionnaires for TSPs.

Apart from internal meetings (amongst Athens demo partners), for collaboration and coordination purposes, sessions with CFMs were also organized, in order to achieve the aforementioned goal. The Athens demo partners, Athens TSPs and members of the committees took part in those sessions:

- Teleconference session with CFMs regarding Location Based Experiences, LBE Editor, LBE Score Sharing, Map Content and Orchestration and Supervision Tool, an introductory call to showcase those functionalities. Conducted on 29/11/2022.
- Discussion on LBEs and Orchestration and Supervision Tool with CFMs, provision of additional information, presentation, and clarifications. Conducted on 24/01/2023.
- Shift2Rail IP4MaaS Athens demo call: Best Price and Mobility Packages discussion with CFMs, a call dedicated to the introduction of the Fare Optimization, the Mobility Packages and the CMMP solutions, in order for all involved partners to fully comprehend the functionalities, their value and potential benefits, as well as their requirements and limitations. Conducted on 27/01/2023.
- Follow up meeting with CFMs regarding LBEs and Orchestration and Supervision Tool, a call regarding their requirements, potential use cases for Athens and next steps regarding provision of the necessary licences, organization of training sessions etc. Conducted on 07/02/2023.
- RIDE2RAIL - IP4MaaS meeting with CFMs on Travel Companion Training, in this session all IP4MaaS partners were included, to have an overview on all basic functionalities and train the demo actors. An extensive session conducted on 08/02/2023.
- Training session on the finalized LBEs and the Orchestration and Supervision Tool, a call during which the CFMs provided targeted, specific and in-depth training to the involved TSPs regarding their installation and usage. Conducted on 22/03/2023.

Throughout all the phases, both prior and during the Athens demonstration, regular communication was maintained with the CFMs and the Committees, in order to ensure that all involved entities are up-to-date with all preparatory actions, that are fully aligned and that all involved TSPs have clear understanding of how the demonstration will be conducted and which

are the goals to be achieved.

In addition to the engagement and training of the TSPs, the proper actions for the engagement and training of the travellers needed to be conducted, to secure the success of the demonstration. The C-REL demonstration in Athens provided Lessons Learned, as mentioned in previous section of this document, which served not only as useful knowledge and experience to be transferred to the rest of the demo sites (Padua, Barcelona, Osijek, Warsaw and Liberec), but also as a valuable input for the F-REL demonstration in Athens in 2023.

Among those lessons learned, a suggestion of changing the user (travellers) engagement approach was provided by the Athens demo leader. More specifically, after assessing all the statistics and metrics of the demo, it was concluded that a 'softer' opening adoption would be more beneficial for the F-REL demonstration in Athens and for the assessment of the demonstration afterwards, meaning that after the Athens demo partners (demo leader and TSPs) conducted all internal tests for one week prior to the demonstration in March 2023, the users to be engaged would come internally. Colleagues, employees, associates, friends, family members etc. from all Athens demo partners would be engaged, trained, and encouraged to partake and make use of the Travel Companion application and its functionalities. All those participants would not have to have any relation to the IP4MaaS project, in order to be even more objective and provide valuable feedback by answering the USI questionnaires aimed for travellers. Consequently, the engagement strategy and the training sessions were modified accordingly, in close collaboration with the CFMs.

- Preparatory call with all Athens demo partners for setting next steps regarding travellers training workshop, engagement of users, organization of additional training sessions and dissemination of necessary material to users. Conducted on 16/02/2023.
- IP4MaaS – Workshop/Training session on Travel Companion; an online session organized by WP4 Leader and Athens Demo Leader which was disseminated to all users the Athens demo partners approached. The WP4 Leader and the Athens Demo Leader provided information regarding the IP4MaaS Project, in order for the users to get familiar, as well as regarding the upcoming demonstration and the incentives. Then the CFMs provided an overview and live demonstration of the Travel Companion app, as well its web application. During this session the CFMs provided to all participants live step-by-steps instructions on how to make use of the application and all of the features that will be tested during the Athens F-REL demonstration, from logging into the application and modifying the profile, to buying mobility packages, reporting issues etc. The workshop took place on 15/03/2023, prior to that the workshop was promoted via social media posts and announcements by all Athens demo partners. In addition, numerous friends, associates, family members and any potentially interested people were also approached by each partner at an internal level prior to the workshop/training session. The recording was also disseminated to all involved entities.

In addition to these meetings and trainings, social media posts and announcements on websites were created and posted, for the general public to learn more about the IP4MaaS and the demonstrations. Also, in parallel to these actions, internal trainings were held within each Athens organization. The respective project managers and other members of the project provided guidance and clarifications to all participating users prior and during the demonstration, in order to ensure high level of engagement and full comprehension of the application by the users, as well as fulfillment of the USI questionnaires after the execution of the demonstration and receival of their incentives, which were OASA cards for limited free rides on busses and metro, as well as taxi rides, as agreed amongst all Athens demo partners.

As conducted during the C-REL demonstration in Athens, the demo leader was responsible for monitoring and coordinating all activities. The demo leader also worked intensively on preparing all download links for the Travel Companion app and the LBEs, after receiving them from the CFMs, as well as texts and e-mail templates that were to be disseminated to the engaged registered users, in order to ensure that all information was user-friendly, easily understandable, accessible and GDPR compliant. The e-mails were refined, since the first demonstration, in order to be even more comprehensible and easy to navigate, the LBE files were, in collaboration with the CFMs, reduced in order to make their installation and usage even user-friendly, the translates user guide and the Terms and Conditions were also provided to ensure full transparency towards users.

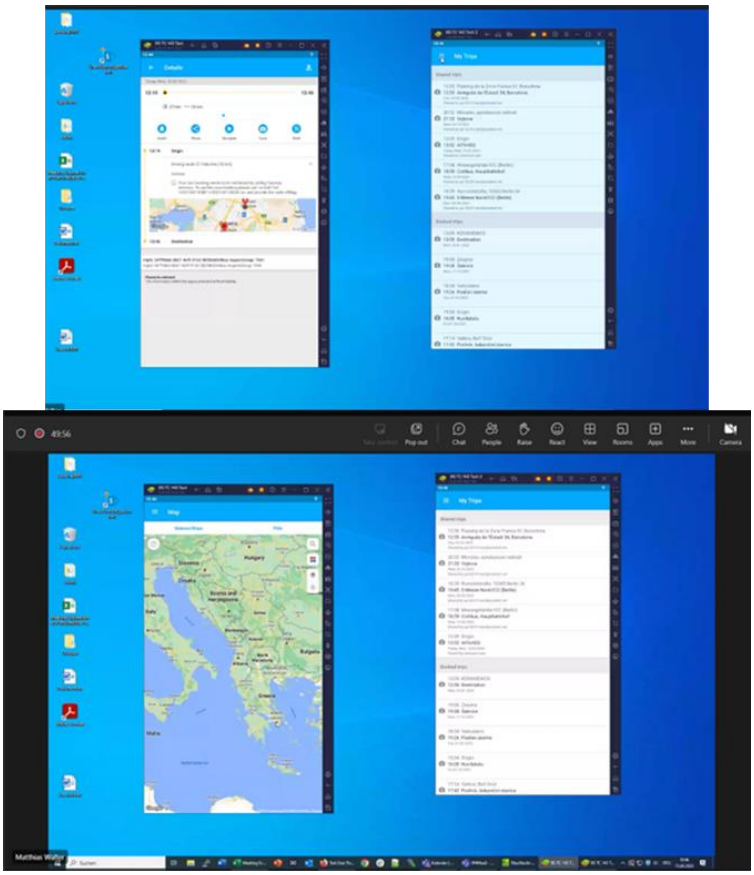

Figure 8: Screenshots for the workshop/training session provided by the CFMs to the engaged users on 15/03/2023

9.2 Demo execution

The demo execution in Athens started on the on the 27th of March, 2023 (Monday) and lasted until the 31st (Friday). During this week, the registered users received an email informing them about the survey and asking them to complete it 3 times; on Tuesday, Thursday and Friday.

As mentioned above, the engagement strategy this time took place only among the participating companies (CERTH, OASA, BRAINBOX, MIRAKLIO TAXIWAY and AETHON). Therefore, the number of users was lower, but demo responsible parties had the opportunity to provide extensive and all-encompassing training before hand in order to be able to use all or at least several of the provided functionalities.

All in all, 79 users registered as demo participants and used the application, while 33 of them completing the survey, accounting to a response rate of 42%, much higher than the 12% achieved during the 1st period.

9.3 Technical and business barriers regarding the sample size for the USI calculation in phase II

Achieving a sufficient responses sample size for different socio-demographic profiles has a high significance in the results of data analysis for this study. Overall, in this assessment, five types of profiles were studied and for these five profiles the following statistics were collected:

r=1 All profiles regarding aggregated analysis: 38 respondents.
r=2 Unemployed people, low-income people, retired people, students: 6 respondents.
r=3 Disabled or impaired people-people with physical or mental illnesses, person in a wheelchair, person with reduced mobility, person with visual impairment, person with hearing impairment: 0 respondents.
r=4 Elderly-People over 65 years old: 0 respondents.
r=5 Women: 21 respondents.

As it can be seen, considering the limited and insufficient number of responses in the Athens demo site phase I, the participation of specific (sensitive) profiles (r=2, 3, 4, 5) was low. This insufficient participation decreased the accuracy of the impacts in the assessment phase. D6.2 "Tool for performance assessment" reports some information on the required sample size for each module of Regression analysis, Bayesian Network analysis, and ANOVA test. These sample sizes (for both general and specific profiles), as described in D6.2, allow to have an accurate and more precise outcome in case of data analysis, minimizing the risk of poor/less significant results in the "USI travellers and USI TSPs" calculation described and presented as outcome of WP3.

9.4 Data sharing agreement with CFMs regarding operational KPIs in phase II

As it has been already described in Phase I, one of the main inputs for the calculation of "Effectiveness" defined in WP3 was the operational KPIs. Concerning the IP4MaaS functionalities, the WP3 leader created an Excel sheet and requested CFMs to provide at least one operational KPI for each functionality that can be collected during the assessment of each demo. After the execution of the Athens demo site phase II, the list and relevant values of operational KPIs linked to the functionalities were obtained. The list of operational KPIs, relevant functionalities, and responsible partners from the CFMs side is shown in the following table:

Table 3: List of operational KPIs assessed in Athens demo site phase II

No.	Innovative technology (functionality)	Units	Responsible partners (CFMs)
1	Journey planning (journey planner)	Average number of modes involved in the journey per trip	Indra

1	Journey planning (journey planner)	Average number of shopped offers	Indra
2	Booking	Average number of booked offers per day	Indra
3	Issuing	Average number of issued offers per day	Indra
4	Mobility packages	Number of mobility packages offered	Indra
5	Guest user	Number of connections without password per day	CFMs
6	Location-Based Experience (LBE)	Number of entertainment services offered during the demo	CS group
7	Asset manager	Number of services integrated with the pilot	Polimi
8	Contractual management marketplace	Number of mobility packages handeled	CFMs
9	Contractual management marketplace	Number of involved stakeholders	CFMs

It should be noted that, considering the methodological framework of IP4MaaS project, each functionality (innovative technology) can have one or more operational KPIs.

9.5 Data sharing agreement regarding the ethical application form (information on the legacy system) in phase II

The process of "Data sharing agreement regarding the ethical application form" was the same as phase I for the Athens demo site. Before execution of the phase I, an ethical application form was prepared by AITEC and approved by IP4MaaS ethics board members. In this ethics application form different ethical issues were explained. The ethics application form consisted of four main sections: SECTION A: Applicant details, SECTION B: Data collection campaign details, SECTION C: Research involving human participants, and SECTION D: Data protection, copyright, and other considerations. For the phase of data collection and data processing, one of the most significant parts was the "Participant information and consent sheet" known as "terms and conditions" in USI surveys. The participation of respondents to the USI questionnaire was entirely voluntary and the survey was done and completed anonymously. According to this, no personal data was collected while in relation to data removal, the email of the Athens demo site leader was dedicated in the form so respondents will ask demo leaders for data removal with the required information (date and time they completed the survey). After such request, demo leaders will ask AITEC and FIT to remove that specific data from the results.

9.6 Evaluation of phase II

The 2nd phase (F-REL) of Athens demonstration had a duration of one week, started on Monday 27th of March 2023 and was concluded on Friday 31st of March. The e-mails of the questionnaires were sent 3 times throughout the duration of the demonstration. The engaged users came from the participating Athens partners, namely CERTH, OASA, Brainbox, Taxiway and AETHON, either

internally (associates, employees etc.) or via more personal cycles of the involved partners (friend, family members, acquaintances).

The demo leader, as soon as the demonstration was concluded, provided the following statistics:

- Number of registered users (travellers): 79.
- Number of users that removed consent: 0.
- Responses (filled in questionnaires) received from TSPs: 3.
- Responses (filled in questionnaires) received from travellers (Greek): 38.
- Number of calls for taxi: 31.
- Number of taxi rides fulfilled:
- Number of bike coupons calls (via Travel Companion app): 23.
- Number Registered Users at the BRAINBOX app: 16.
- Bike Rentals: 37.

Lessons Learned were extracted and presented to the whole consortium, as well as to the other demo sites, to serve as a reference, as fruitful suggestions for optimisations and assist the following demonstrations in executing even more successful and smooth demonstrations. Those lessons learned, along with all other lessons learned other demo sites produced, and along with the feedback of users (TSPs and travellers alike) will also serve as valuable input for future demonstrations and for further development of the Travel Companion in the future.

Lessons Learned regarding the design of the demonstration:

- Design of procedures to use the mobility services; due to the enriched Travel Companion functionalities, new procedures may be required. The new procedures should be well discussed with TSPs and their key personnel.
- The registration site and processes need to be very carefully designed.
- The actual costs of the mobility services during the demonstrations should be thoroughly explained and clarified to the engaged users, to ensure their participation and avoid misunderstandings that could prevent them from using the application. What will the exact prices be during the demonstration, which kind of services will be free or covered by a respective reserve of the project (e.g., taxi rides).
- Clear and encouraging incentives also play a key role in engaging users.
- Apart from trainings and workshops, other actions that can add value to the endeavour and benefit the demonstration and the project altogether is the elaborate definition of scenarios of use, as well as their communication to the users. That way the users will know exactly what and how they are going to conduct during each pilot.
- The engagement of many different users, with different characteristics, needs, wishes etc. and different routines, destinations, preferred means of transport etc. ensures that all offered mobility services and features of the application may be covered and thus have

adequate feedback by the end of the demonstration for almost all the functionalities. Thus, the careful selection of users also is also a key factor of success.

- Users that have experience in the transport network are preferred for such demonstrations.

Lessons Learned regarding the preparation of the demonstrations:

- Preparation/training of the users: The engaged users shall not only become aware of the Travel Companion functionalities but also of the procedures, the incentives, the registration etc. That way the expectations may be successfully managed.
- The technical environment is essential to be stable, regarding APIs, GTFS/NetEX data etc, in order to avoid disruptions or crashes of the app that can put at risk users' overall experience.
- A well organised incentive-provision preparation procedure to provide the incentives to the users is essential, to increase/keep high the users' satisfaction, with regards to their overall experience.
- A recommendation was also provided: the week previous to the demonstration is dedicated to testing; it can be useful to involve a few of the engaged users as a focus group to go through all the procedures (registration, application downloading, use of the application and its functionalities, survey receival and provision of feedback) to identify issues as early as possible.

Lessons Learned regarding user management:

- All procedures, from the preparation phase all the way to concluding the demonstrations and their evaluation, need to be GDPR compliant. Other demo actors need to be cautious though, since this compliance may make the efficient provision of support to users more difficult.
- Continuous technical support to the TSPs and the travellers during the demonstration is of essence.

Lessons Learned regarding the questionnaires:

- Terms and conditions, as well as the questionnaire itself, need to provide detailed information to the user about all aspects of data, their collection, management, storage, usage etc. in order to ensure GDPR compliance.
- Future surveys could be even more customized for each demo site. It is recommended to recheck and consult regularly with demo site partners (demo leader and TSPs) and CFMs, in order to ensure that all are fully aligned (functionalities demonstrated and the corresponding questions in the surveys). Regular communication is key to address and adapt to even last-minute changes.

- The incentives and how to claim them could be communicated clearly at the beginning of the survey as well, so the user may be immediately reminded of the process and thus proceed with confidence.

10. Conclusions

The delivery of innovative services like the MaaS, requires extensions in current activity-based modelling, considering the dynamic context of modern lifestyle, social influence, ICT, responses to travel recommendation systems, attitudes, subjective considerations, and the increasing degree of uncertainty. Thus, a critical reflection on how to expand current activity-based models and their underlying theories and choice models is needed to better capture the comprehensive nature of the travel behaviour and decision-making process related to MaaS. The novelty and fuzzy nature of MaaS make it a challenge to ascertain MaaS, to explore its implications, and how to address them.

The Athens IP4MaaS demo site used real data, real processes, and diverse transport stakeholders to provide a comprehensive proof of concept for demonstrating business processes and formulating business rules to expand collaboration between transport providers and provide directions to actors to develop customized MaaS packages. Identification of challenges at the planning and implementation level could be used to guide decision-making in other similar MaaS schemes, regarding mode selection, creation of incentives, development of mobility packages, and formulation of policies to shift travellers' behaviour towards using and benefiting from MaaS. The major challenges that were faced are related to technological and legal issues, and more specifically they relate to lack of interoperability among involved TSPs, data protection, and lack of open traffic data frameworks to ensure that dynamic public transport may be shared among involved stakeholders. To overcome these challenges, a set of supportive tools and methods were used, such as QR codes, re-direction to other apps by providing a link, and mobility package application. Although these solutions worked in the context of the demo, they also prove the need of addressing MaaS challenges for building a competing mobility service that is reliable, satisfies user needs and improves accessibility for all users. Therefore, some improvements of the tools in particular on the technological side are needed in order to let them be ready to be shared in a pre-market context and on wide scale.

Except for demo challenges that were mentioned in earlier sections that might be considered as MaaS implementation limitations, it has to be considered that the overall numbers, despite being in line with similar experiences in other demos, are still quite limited. It is recommended, on top of the previously mentioned improvement of the application/ecosystem from the technological and user-friendliness point of view, to extend the demo period to more than two weeks, in order to attract more people and monitor the ecosystem utilization over time. Unfortunately, the nature of the project and the tight calendar of necessary activities (from the integration to the execution to the follow up) prevented to have an extended demo duration.

11. References

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