Deliverable D5.7
Final report on Warsaw demonstration execution

Project acronym:	IP4MaaS
Starting date:	01/12/2020
Duration (in months):	31 months
Call (part) identifier:	S2R-OC-IP4-01-2020
Grant agreement no:	101015492
Due date of deliverable:	Month 30
Actual submission date:	21-06-2023
Responsible/Author:	MIASTO WARSZAWA
Dissemination level:	PU
Status:	Issued

Reviewed: yes

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101015492.

Document history		
Revision	*Date*	*Description*
1	12/06/2023	First issue
2	20/06/2023	Second issue
3	21/06/2023	Final issue and submission

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1. Executive Summary

The aim of the Deliverable 5.7 “Final report on Warsaw Demonstration execution” is to present the timeline and details of preparation and execution of Warsaw Demonstration taking place as a part of the IP4MaaS project within the framework of the Shift2Rail Joint Undertaking. The demonstrated technologies were selected functionalities of the Travel Companion application.

The demonstration consisted in passing on the Travel Companion application to a group of recruited testers who were given a link to download and install the Travel Companion application, use it while travelling by means of Warsaw Public Transport (i.e., buses, trams, metro, city trains) and to provide us feedback regarding the selected functionalities with the use of the online User Satisfaction Index questionnaire form. The USI questionnaire was developed as part of the WP3, task T3.2 “User satisfaction with IP4 solutions”.

To this end, the Deliverable 5.7 outlines the various activities that took place as part of coordination and fostering of the Warsaw Demo preparation and execution, reports the contribution of the Warsaw demonstration team to technological integration, reports the internal testing of the integrated technology and the outcomes and findings of the Warsaw demonstration activities.

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
WD	Warsaw Demonstration
WP	Work Package
WPL	Work package leader

3. Background

As mentioned, the present document constitutes the Deliverable D5.7 “Final report on Warsaw demonstration execution” of the T5.7 “Warsaw demonstration” (WD) of the WP5 in the framework of the 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.

More specifically, he results and conclusions of the WD execution presented in this document will also contribute to Task 5.1 of the IP4MaaS project – “Coordination of the demonstrations executions” and the correspondingDeliverable D5.1 “Results of the demonstrations”. Finally, they contribute as well to WP6 D6.2 “Performance assessment”.

4. Objective/Aim

This document has been prepared to provide the description of the preparation, execution and results of the WD which is a task T5.7 of the WP5 of the IP4MaaS project.

The aims of this document are to provide:

- The presentation of the WD goals,
- The report of the participation of the WD team in the meetings and workshops dedicated to coordinate and foster the demo preparation and execution,
- The selection of the functionalities that were integrated for the WD,
- The outline of the User Engagement Strategy designed and implemented by the WD team,
- The division of tasks within the WD team and inner coordination of the preparation to the WD execution,
- The Travel Companion integration with the existing local journey planning API,
- The internal testing phase after the integration,
- The training of the testers of the Travel Companion application,
- The reporting of the issues regarding the Travel Companion application,
- The WD execution: the number of registered testers, the amount of USI questionnaires delivered, the feedback provided by the testers outside of the framework of the USI questionnaires,
- The testing of the functionality dedicated to the TSPs.
- The conclusions extracted after the execution of WD.

5. General information about demonstration site

WD site is an area covered by the services of Warsaw Public Transport, which consists of the city of Warsaw and 34 neighbouring communities.

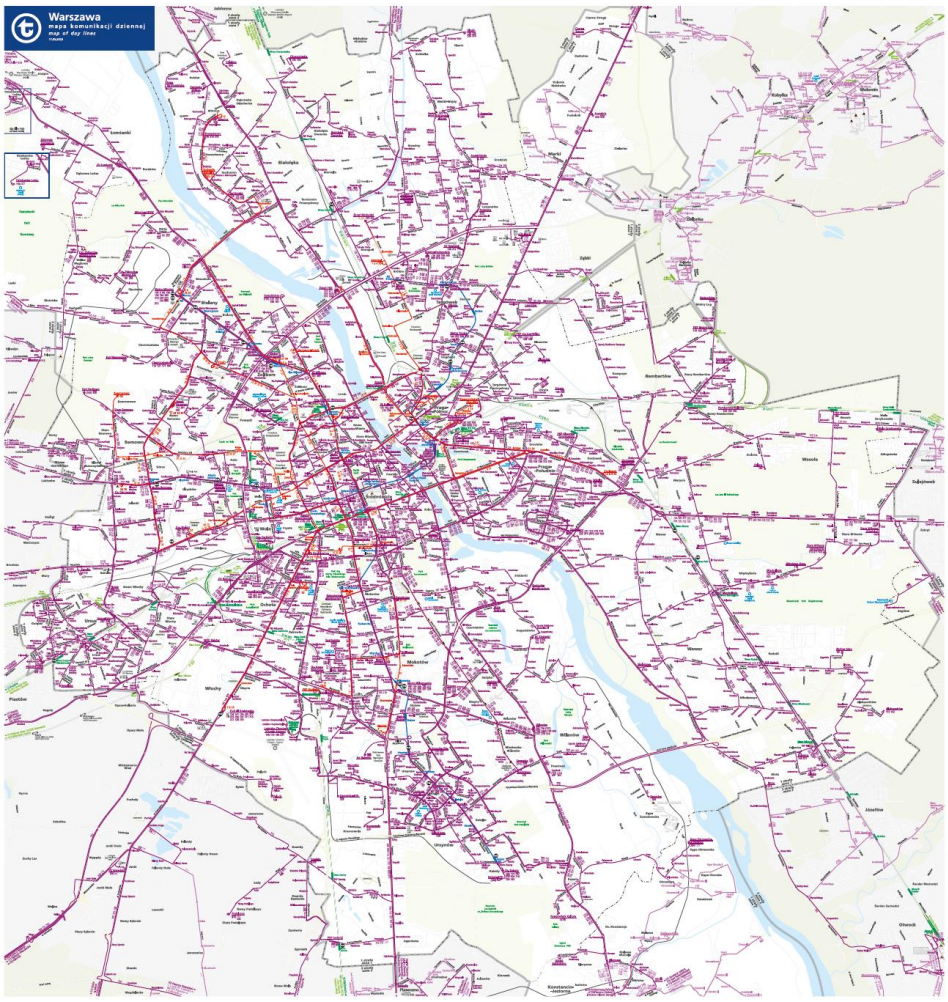

Figure 1: The general scheme of daytime Warsaw Public Transport net, available, along with an interactive Warsaw Public Transport map, at: https://www.wtp.waw.pl/en/maps-schemas/

The WD was prepared, coordinated and executed by:

- **ZTM Warsaw** (Public Transport Authority representing MIASTO WARSZAWA – The City of Warsaw). The Public Transport Authority of Warsaw, the capital city of Poland with population of over 1,86 million, is the municipal entity tasked with the management and supervision of Warsaw Public Transport, which consists of 2 underground lines, 7 city train lines, 34 tram lines and 252 bus lines. The total length of all lines within the city of

Warsaw is 3500 km. In 2022, the estimated amount of passengers who travelled with Warsaw Public Transport, was almost 864 million.

ZTM team members in the WDwere:

- Piotr Załęcki
- Joanna Filipek
- Marta Trzaskowska
- Aleksandra Puzyńska
- Dorota Grotowska

- **MZA** (Miejskie Zakłady Autobusowe is a municipal bus Operator, providing service of 184 bus lines, as well as responsible for maintenance and development of bus depots, as well as investing in rolling stock. MZA owns 1412 vehicles, 160 of which are electric buses and 305 – low emission gas buses. The number of vehicle-kilometres performed in 2022 is over 82 million. MZA employs over 4 000 people.

MZA team members in the WD were:

- Katarzyna Kwiatkowska
- Jakub Grabiec
- Andrzej Szweycer

- **TW** (Tramwaje Warszawskie) is a municipal tram Operator, providing service of the 24 tram lines in the city of Warsaw, as well as responsible for maintenance and development of all relevant infrastructure, including trackways, electric traction and depots, and investment in rolling stock. TW employs over 3700 people.

TW team members in the WD were:

- Marcin Buszka
- Marcin Cupriak
- Arkadiusz Pyrzewicz

Warsaw demo goal:
The overall goal of the WD was fostering the uptake of the MaaS-related technologies by getting knowledge and experience about the conditions of creating the MaaS ecosystem. The activities of integrating and demonstrating the use of the IP4 technologies have provided the valuable experience as well as insights and knowledge that we were seeking.

6. Preparation phase

Below we listed the activities that were part of the WD preparation phase. Some of them,

including User Engagement Strategy, selection of Travel Companion Functionalities for the WD, as well as internal testing and trainings will be described in more detail in the following sections.

The WD preparation phase consisted of the following activities:

- Regular coordination calls/meetings
- Task division between demo leader and TSPs
- Creation of User Engagement Strategy
- Creation of task Check-list with assigned task owners and deadlines: **Check-list-Warsaw_demo_final.xlsx**
- Division of WD team tasks into 6 substantial groups:
  - Management,
  - USI,
  - Recruitment,
  - Promotion,
  - Workshops,
  - Application, and assigning task group owners
- Risk assessment with assigned mitigation measures
- Cooperation in preparing and translation of the USI questionnaire
- Selecting the Travel Companion functionalities to be tested in Warsaw
- Translation of the Travel Companion application and of material distributed to users
- Providing access to the necessary local journey planning web-service API
- Providing access to data sources necessary for proper functionalities' integration
- Coordinating the integration process with the CFMs
- Internal testing and providing feedback to the CFMs with the use of the Mantis bug reporting tool
- Preparing materials and scenarios for trainings for the testers and conducting the online trainings

6.1. Demonstrated functionalities

The application tested during the WD was the Travel Companion Version-r1.0.156-SNAPSHOT-DEMO-regular.

The table below shows the list of Travel Companion functionalities tested in Warsaw. All the WD partners (ZTM, MZA, TW) took part in testing all of these functionalities. The functionalities were supplied with the GTFS data and journey planner web-service (API) provided by the WD leader and integrated with the Travel Companion.

Table 1: Presentation of Travel Companion functionalities selected for the WD.

List of Travel Companion functionalities planned for WD		
23	**Asset Manager (TSP)**	The platform to provide and describe the services and facilities in the IP4 platform and identify the integration of these services in the IP4 ecosystem
1	**Journey Planner**	The function to find routes involving different modes of transport (metro, tram, bus…) in a journey from an origin to a destination
10	**Navigation**	The function to navigate to the correct metro or bus stop based on the user's position, including the interchanges among different means of transport
11	**Traveller's Feedback**	The function for submitting or providing feedback about delays, cleanness of stations, disruptions, and crowdedness in public transportation or road environment that might be helpful for other travellers
12	**Trip Sharing**	The function for sharing an ongoing trip and journey updates to other users
14	**Travel Arrangement**	The function for planning trips for other application users
16	**Guest User**	The function for using the application as a guest, i.e. without logging in, for quick trip planning including features such as navigation and shopping experience
~~17~~	~~**Preferences and Profiles**~~	~~The function for customizing the application and setting different travel preferences such as payment method, special needs, favorite mode, seat selection, refund, and monitoring trip~~ - this function was rejected from demonstration during the internal testing phase due to the inadequate and incomprehensible translation
P1	**Digital Onboarding**	The function that allows the use of biometrics (fingerprint) to log in the Travel Companion application
P8	**Collaborative Space (travellers)**	The function for the travellers for sharing their experiences such as the quality of transport services, delays, overcrowding, and security issues on stations or vehicles, and view other users' experiences

6.2. User engagement strategy

The User Engagement Strategy for the WD was mainly focused on the selection of the target groups of testers, defining communication channels and recruitment process as well as selecting proper incentives that would encourage active participation and delivering the filled in USI questionnaires.

The WD team decided to recruit testers among their employees and their families, as well as among the students of relevant faculties of Warsaw universities.

Wireless headphones were selected as incentives.

The User Engagement Strategy for WD consisted of:

- Internal communication using e-mails of ZTM, MZA, TW (messages sent on 3rd and 6th April) and ZTM's, MZA's and TW's corporate intranets (publications on 3rd April and 17th April),
- posting information on ZTM website (starting from 3rd April),
- posting information on MZA webkiosks (19th April)
- posting information on information boards at MZA bus depots (19th April)
- posting information on ZTM's, MZA's and TW's Facebook pages (26th April),
- cooperation with Warsaw universities (Faculty of Geography and Regional Studies University of Warsaw, Faculty of Transport – Warsaw University of Technology and The Institute of Infrastructure, Transport and Mobility, Warsaw School of Economics) - posted on their departments' websites (started from 3rd April),
- providing information about incentives - wireless headphones,
- providing non-obligatory online trainings for testers with a choice of 3 different dates,
- the requirements for testing the application were: age above 18, a device with Android – minimal version: 7.

Lubisz nowinki techniczne? Zostań testerem/testerką aplikacji!

Zarząd Transportu Miejskiego, Miejskie Zakłady Autobusowe i Tramwaje Warszawskie zapraszają do wzięcia udziału w testach aplikacji Travel Companion. Dla osób, które przetestują nowe narzędzie oraz wypełnią ankietę oceniającą jego funkcjonalności, przygotowaliśmy atrakcyjne upominki reklamowe.

ZTM wraz z MZA i TW od 2020 r. biorą udział w projekcie „Shift2Rail – IP4MaaS"* To duży projekt europejski, w ramach którego ZTM został poproszony o przetestowanie, jak w warszawskich realiach sprawdzi się nowa aplikacja do planowania podróży Travel Companion (TC). Na razie to tylko projekt badawczy, ale dalszym celem jest powstanie realnego produktu – aplikacji. Aby przekonać się o jego skuteczności potrzebujemy Waszej pomocy! Nie zrobimy tego sami zza biurek!

Jeśli więc jesteś fanem/fanką nowych technologii, skończyłeś/skończyłaś 18 lat, dostrzegasz możliwości nowoczesnych narzędzi do planowania podróży oraz chcesz przyczynić się do powstania nowego, zostań testerem/testerką Travel Companion.

Figure 2: a screenshot showing a fragment of the publication in ZTM's corporate intranet

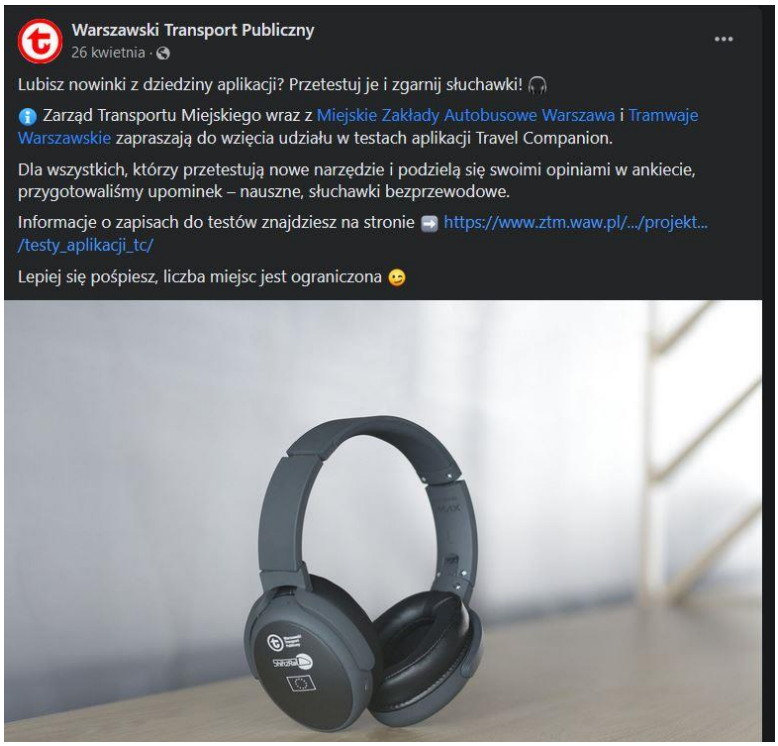

Figure 3: a screenshot showing the post on Warsaw Public Transport facebook page

Figure 4: a screenshot showing information displayed on MZA webkiosk

6.3. Internal coordination

The preparation of WD was supported by:

- Participation of WD team members in monthly WP5 coordination calls with WP5 leader, starting from December 2021,
- Participation in meetings and workshops with the CFMs,
- Regular biweekly internal WD team calls starting from November 2022,
- Regular correspondence via e-mail with all relevant parties, including internal correspondence of WD team in all matters regarding the IP4MaaS project and WD preparation.

Responsibilities of demo partners:

- **ZTM (MIASTO WARSZAWA)** – WD leader – coordination of all WD preparatory activities, supervision over WD preparation, preparation of all relevant project documents, necessary translations, publishing information about WD, purchase of incentives, internal testing, cooperation with CFMs, distribution of incentives
- **TW (TRAM WARSAW)** and **MZA (MIEJSKIE ZAKLADY AUTOBUSOWE)** – support, feedback and active participation in WD preparatory activities, revision of prepared documents, publishing information about WD, purchase of incentives, internal testing and providing feedback about the TC application to the WD leader

6.4. Internal testing

The internal testing for the WD took place **between 5th and 14th May 2023**. All WD team members downloaded and used the application with special focus on the functionalities selected for WD and provided feedback including description of the issues, screenshots and screen recordings to Marta Trzaskowska, who was responsible for reporting all issues through the Mantis bug reporting tool and for communication with the respective CFM representatives.

The reporting of the issues was continued during the WD execution as well as right after the demonstration, when final feedback was provided to the CFMs due to the fact that some of the testers provided additional feedback after the demonstration.

The internal testing phase reporting comprised a number of issues listed in the table below.
It is important to mention that the majority of the issues identified has been closed either as solved or closed as suspended to be solved at the following versions of the application.

Table 2: TC´s issues identified during internal testing.

	WD internal testing TC app issues reported			
No.	Issue	Description	Significance	Issue status
1	**General TC app issue**	The TC app doesn't open or respond	critical	Occurred twice, both times closed as solved
2	**Main TC Menu issue**	The main menu of the application changes between Polish and English version	high	closed as non-reproducible by the CFMs
3	**Logout issue**	Sometimes, it is impossible to log out from the TC app	high	Closed as suspended – to be improved
4	**Journey Planner issue**	The alarm for planned journey doesn't send push notifications	low	Closed – the reason for the issue is lack of Trip Tracking functionality integrated – it is required for the alarms to send notifications
5	**Journey Planner issue**	Regarding the train connections, some of the responses display "unknown line" instead of a defined train line	high	Closed as not needing attendace – the issue occurs due to KORID placing Warsaw local trains in their database as undefined connections, and data interference 7occurs – it is not fixable for the Warsaw demo, but it is not an app issue, but integration issue
6	**Journey Planner issue**	First connection is walking connection, even if it's over 1km walk	low	Closed as not needing attendance – the TC app prioritises walking as a first option if the walk is up to 2 kms
7	**Journey Planner issue**	Long connection search time	high	Closed as improved

8	**Trip Sharing issue**	The user with whom the rip is shared doesn't get a notification	low	Closed as non-reproducible both by the CFMs and by the Warsaw demo team
9	**Saved/Shared Trips issue**	Saved or shared trips can't be cancelled – the full history is displayed	low	Closed as not going to be solved
10	**Saved trips (My trips) issue**	My Trips occasionally shows trips of other users	high	Closed as non-requiring solving – the issue occurred in the Guest User mode, which doesn't provide the access to "My trips" menu
11	**Saved Trips (My Trips) issue**	Saved trips displayed non-chronologically	low	Closed as solved
12	**Collaborative Space (travellers) issue**	Long image/video loading time, sometimes the application closes when the users try to view the uploaded photos/videos	high	closed as suspended – to be improved
13	**Collaborative Space (travellers) issue**	The Collaborative Space module tends to crash or stop the TC app	high	Closed as suspended – to be improved
14	**Digital onboarding issue**	Biometric login impossible	high	closed as non-reproducible by the CFMs
15	**Digital onboarding issue**	It is impossible to log in using biometrics after having logged in and out to another account on the same device and trying to log in back as the previous user	low	Closed as suspended – to be improved
16	**Traveller's Feedback issue**	When the localisation hasn't been enabled when initializing the use of the TC app, it is not possible to report via Traveller's Feedback function, but the app doesn't show the notification about the necessity to turn on localisation, nothing happens	low	closed as suspended – to be improved in the next TC versions
17	**Navigation issue**	Navigation shows bus routes and footpaths in a straight line and sometimes through inaccessible areas	low	closed as suspended

6.5. Training session

Tester training activities for WD consisted **of 3 online training sessions for registered testers that took place on 11th, 12th and 16th May 2023**. The 3 dates were proposed in order for the testers to be able to choose the most suitable time for them. The trainings were prepared and conducted by Aleksandra Puzyńska. The participation was not mandatory.

The attendance was very low: respectively **4, 3 and 6 people**.

For the needs of the workshop, **a user manual** (instruction) and **a video with instructions regarding the proper downloading of the Travel Companion application** were prepared. Those materials were also sent to all registered testers via e-mail. Both the user manual and the video turned out very helpful tools due to the fact that during the trainings, the application crashed, was unresponsive and it was impossible to demonstrate the use of the selected functionalities in real time.

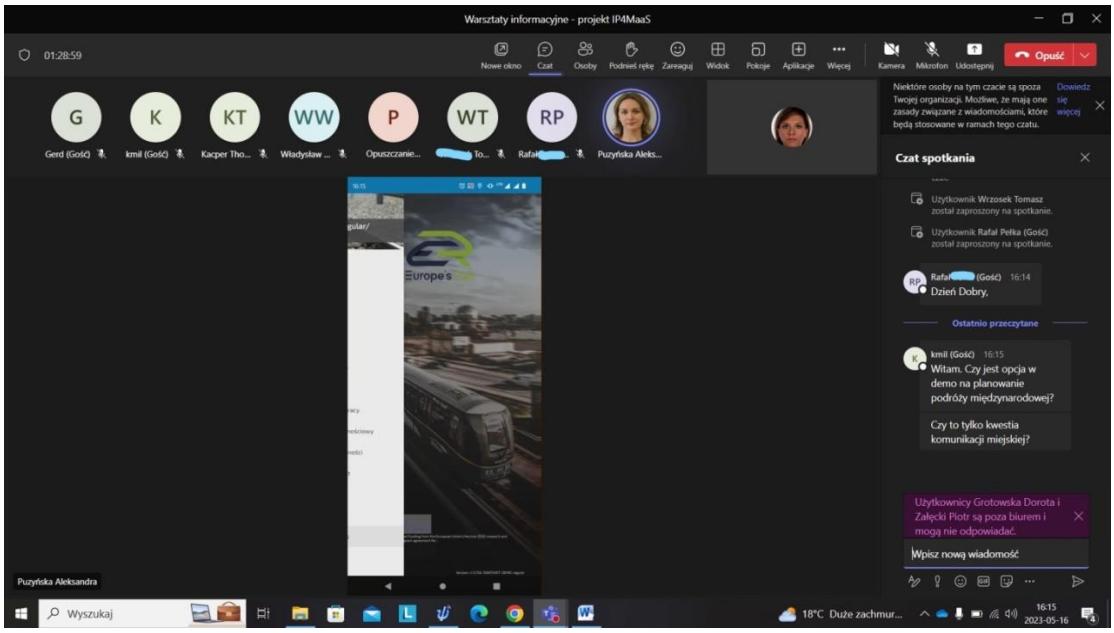

Figure 5: a screenshot showing one of the online trainings for testers

7. Pilot execution

Dates of the WD:
WD took place between **15th and 19th May 2023**.

Functionalities tested:
The functionalities tested are displayed in a table in the point 6.1 “Demonstrated functionalities. The Preferences and Profiles functionality was not tested in the end as during the internal testing phase many issues were encountered and there was not sufficient time to fix the errors.

The WD area coverage:
The demonstration covered the whole area of operation of Warsaw Public Transport. We gave the testers full freedom in their travels. We assumed that limiting the testing area in any specified way was unjustified, given that the whole area of Warsaw Public Transport operation has been covered by the Travel Companion journey planner. As a result, we got a 74% return. This is the percentage of incentive codes sent to us related to the total amount of registered testers.

Testers:
Overall, **244 testers registered** through dedicated e-mail address:
rekrutacjaip4maas@ztm.waw.pl
The submission of **204 USI questionnaires for travellers** has been reported by AITEC.
The submission of **7 USI questionnaires for TSPs** has been reported by AITEC.
181 testers submitted codes for incentives that were displayed after the submission of the USI questionnaire.

Communication:
The communication between the WD team and the testers was possible via e-mail: rekrutacjaip4maas@ztm.waw.pl. Any new reported issues were passed on to the CFMs through the Mantis bug reporting tool. A few testers reported additional issues in person, while collecting the incentives. All those issues were reported to the CFMs to allow them to fix them and improve the TC as well as the IP4 technological ecosystem.

8. Evaluation phase and results

The WD has proven a source of valuable insights and feedback for the WD team, the IP4MaaS project consortium and Travel Companion application developers. The design and execution of the WD activities and most importantly – the feedback we got from the testers, have brought results that can be considered important lessons learned and a set of guidelines in future activities:

- The type and value of incentives is crucial for user engagement, because it provides motivation for participation as well as delivering completed USI questionnaires,
- The communication necessary for user engagement has to be repeated in order to increase the participation – we noted waves of registrations after each publication,
- Defining targeted groups of potential testers is crucial for user engagement as it makes communication promoting the testing much better tailored in terms of channels of communication as well as content and provides better return,
- The translation of the application can only be performed properly when the application is known to the translators, otherwise the lack of context creates the risk of the translation turn out confusing,

- It is paramount to have an application duly translated in all its parts, in order to avoid any kind of confusion in the users,
- The TC application maturity level, as well as its usability, is low in comparison to a commonly used journey planning application available in Warsaw. This makes the TC good if its utilization is planned in the frame of a research project such as IP4MaaS, with a relatively low TRL level, and the feedback provided by the users is important for improving the app making some steps further towards its utilization on a much larger scale,
- It is important to adapt the USI survey to the potential spectrum of users (for example, identifying the best place where to put the box for written feedback, largely used by Warsaw demo participants).

9. Conclusions

The goal of the WD as part of the IP4MaaS project was to obtain and deliver feedback on the functioning and usefulness of selected functionalities of the TC application from its users, as well as their possible readiness to use some features for a fee.

The aim of the WD team was to get knowledge and experience necessary to contribute to Warsaw's MaaS readiness as well as understand better the process of implementing MaaS-related technologies.

Both the overall goal of WD within the scope of the IP4MaaS project and the specific goal of the City of Warsaw as the IP4MaaS consortium partner have been accomplished.

Warsaw has achieved the engagement of 244 testers and 204 provided their feedback by answering the USI questionnaires. Respectively, 7 USI questionnaires evaluating the Asset Manager – a functionality for the TSPs, were delivered.

The modification of the USI questionnaire providing a comment box after assessment of each selected functionality enabled a broader scope of the testers' feedback and resulted in 16 pages of raw, unprocessed written comments.

Feedback from users showed that overall impressions of the demo were quite positive as quoted by one of them:

"[The Travel Companion application is] Generally a good idea, but it will be possible to evaluate it only after it is fully prepared for testing, after it will be polished and all the functionalities will be able to be tested."

Due to the common feedback that the application is not yet ready for being distributed and used on a very large scale, and that is not ready as other apps already on the market , explaining that

the demo version should not be compared to existing, well-known local travel planners, as it still needs a lot of refinement, was not a simple task.

The positive feedback from the testers regarded mainly:

- The potential of the **Collaborative Space for travelers** functionality, with reservations regarding its actual functioning, mainly concerning the length of time needed to view the uploaded photos and videos, as well as the counterintuitive design of the general interface of the functionality; overall, the testers expressed the usefulness of this functionality and the need to be able to share feedback regarding the current events on public transport;
- The **Digital Onboarding** (biometric fingerprint login) functionality which has been evaluated as facilitating fast application access and improving application user's privacy;
- The usefulness of the **Guest User** function to the people who avoid providing personal data online;
- The potential of the **Travel Arrangement** function to support travelling of the family members;
- The comfort of the possibility of **saving trips** regarding the easier access to frequently used connections;
- The fact that the Travel Companion journey planner provides alternative stops for ending the journey in case they're in similar distance to destination.

The most common issues reported in the written comments were those about:

- Too slow operation of the application
- Frequent crashing of the application
- Too slow connection searching
- Too few connection options displayed
- Lack of possibility to scroll to view earlier/later connections without the necessity to renew the search for different time
- Proposed connections in some cases not optimal
- Faulty localisation performance due to the poor GPS coordination
- Straight lines presenting public transport routes instead of lines mapping the actual routes
- Problems with biometric login on some devices
- Counterintuitive design of the Collaboration Space for travellers
- Long time loading photos/videos in the Collaboration Space for travellers

The reported highlights and issues clearly indicate that the Travel Companion application, while presenting a (well recognized) great potential, still requires improvement and refinement in

order to be widely used on a very large scale, outside the scope of a research project like IP4MaaS (in which users were duly trained and assisted at multiple levels and at all stages of their involvement by demo leaders/demo teams). These issues, sometimes linked to the technology itself, sometimes linked on specific searches/app utilization, have been communicated to CFMs in order to allow them to get insights directly coming from the users and to (whenever possible) work on the app/ecosystem improvement.

Warsaw's testers' feedback has been considered helpful by the CFMs and the WD team has been informed that some of the reported issues have already been refined in the following versions of the Travel Companion, showing the importance of the iterative process and the "learning by doing" approach utilized in IP4MaaS. As part of the demo activities, there was a "continuous learning" process, thanks to which the CFMs and in general all partners involved in the management of the ecosystem and in the preparation of demo activities could take advantage of other experiences, addressing and correcting (whenever possible) issues on the technical and operational side, improving the tool according to what the technology allows and improving the way the demo is executed delivering more successful results.

The improved features regarded mainly the saved travels displaying mode, biometric login issues or photo/video feedback loading time in Collaboration Space for travelers.