

DEMO FINAL REPORT OSIJEK (MULTIMODAL JOURNEY PLANNER)

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1. Objectives of the pilot

The aim of the Osijek pilot is to improve and integrate information on public transport and other mobility services. According to the requirements identified during the co-design process, the value proposition for the Osijek pilot is to improve accessibility to the network and multimodality through digitalization. The solution focuses on citizens as target groups, that can be segmented according to their mobility habits. Customer relationships considered for the pilot service are represented mainly by the online support system for testers, that is supposed to be maintained and expanded during the start-up phase and beyond.

The initial objective of the Osijek pilot was to develop innovative solutions for the three problems: connections between less densely populated areas and the City of Osijek, lack of integration between different mobility modes and lack of mobility services adjusted to students and vulnerable groups.

To address recognized mobility challenge one solution have been identified a multimodal journey planner tool (MMJP). The MMJP tool is developed on the open-source platform Digitransit by the active cooperation of the external IT experts. As the pilot elements in Osijek region had a demonstration character, and the development process considered and included relevant experience from other pilot regions, the results have potential in terms of contribution to the implementation of innovative mobility service on a transnational level.

Development of MMJP is a step forward to the integration of different public transport services. Currently, there are several existing transport public services but also mobility services under implementation in Osijek pilot region. The MMJP tool will integrate railway transport on a national/regional level and urban transport modes in the first phase. Furthermore, the tool considers also the integration of flexible transport services like bike sharing, car sharing and demand responsive transport (DRT). This kind of service enhances higher regional mobility quality and trip experience satisfaction.

The project results have a positive impact on improving the connectivity of the Osijek region. Besides that, the integration of innovative and flexible services with traditional public services significantly contributes to the achievement of sustainable mobility goals. In the first place, new mobility solutions provide more travel options for passengers and enhance a journey experience. Finally, that will impact the change in user behaviour toward more clean transport modes. The experienced gained throughout this project influence the policy-making processes on the local, regional but also national level. Furthermore, the upscaling process in terms of MMJP tool upgrade has already started, co-funded by another Interreg project. As the national intention is to ensure conditions for the implementation of MMJP services, including funding options, it is expected that more regions in Croatia will investigate the benefits of on-demand public transport services.

2. Pilot area description

The City of Osijek is a centre of Osijek - Baranja County (regional administrative unit shown in Figure 1) and one of four macro-regional centres in the Republic of Croatia. It is also a gravitational point of an entire Eastern Croatia (Slavonija, Baranja and Srijem), a region where 84,9% of settlements face depopulation.

In local terms, the City of Osijek is also a centre of Osijek Urban Agglomeration (OSUA). The territory of the agglomeration is formally defined using the criteria of more than 15% share of daily migrations to the City of Osijek, which makes OSUA the functional area most appropriate for urban transport planning and development.

In broader geographical / topographical terms, Osijek - Baranja County belongs to Pannonian Basin, with a significant influence of Danube and Drava (rivers) and is mostly consisted of lowlands. As a result of these



two rivers' impact, especially Danube affecting the water level of Drava, a unique wetland area of Kopački rit (north of the City of Osijek) was created. (Figure 1).



Figure 1: Osijek - Baranja County; Source: https://commons.wikimedia.org/wiki/File:Croatia,_Osijek-Baranja_County.svg, <https://oikon.hr/development-tourism-master-plan-osijek-baranja-county/>

Southwest parts of the County cover hilly terrain and low highlands (slopes of Dilj and Krndija mountains), rich in water streams. The County covers an area of 4.155km² and is consisted of 7 urban settlements and 35 municipalities, with 264 settlements in total. Agricultural surfaces encompass 64% of County's territory, 27% is covered by woods and 4,3%.by Kopački rit Nature Park.

Considering the fact that Osijek is the centre of the County and also a university centre of the region, there is a certain number of daily commuters arriving from neighbouring settlements and counties. There were 817.583 rail passengers during 2021 in Osijek Baranja County, reduced by 8% in 2020. When comparing the number of passengers to other counties in Croatia, Osijek Baranja County is in the middle.

Although a potential exists to establish an integrated passenger transport on Osijek urban agglomeration territory (OSUA), it can be used only after investing into improvement of the existing rail infrastructure. Moreover, rail passenger transport is, according to survey results, least attractive to PT users. Therefore, the need to improve the service and integrate it with other local modes is evident.

Schedule based services in the City of Osijek and Osijek Urban Agglomeration include bus, tram and rail transport. Public transport service has a historic and cultural meaning for the inhabitants of Osijek: first horsecar was introduced in 1884 and a first electrical tram in 1926. Along with Zagreb, Osijek is the only city in Croatia that preserved and is still using the tram system.

Scope and quality of bus and tram public transport service in the City of Osijek is defined by the Framework agreement on services in the public interest and public transport in the City of Osijek for the period from 2016 to 2032. The Agreement was signed with Gradski prijevoz putnika (GPP) Ltd., a local public transport (PT) provider almost entirely owned by the City of Osijek. The minor share (0,49%) is owned by Antunovac, Čepin, Erdut, Ernestinovo, Vuka, Semeljci, Vladislavci and Bilje municipalities. The company provides tram transport service (exclusively within the city) and bus transport service (in the city and several surrounding municipalities).

Although multiannual data show a certain increase of transport demand within GPP bus sub-system, total number of public transport users in Osijek (but also the entire Eastern Croatia) is decreasing, which can be attributed to negative demographic and economic trends in the region that have only recently begun to

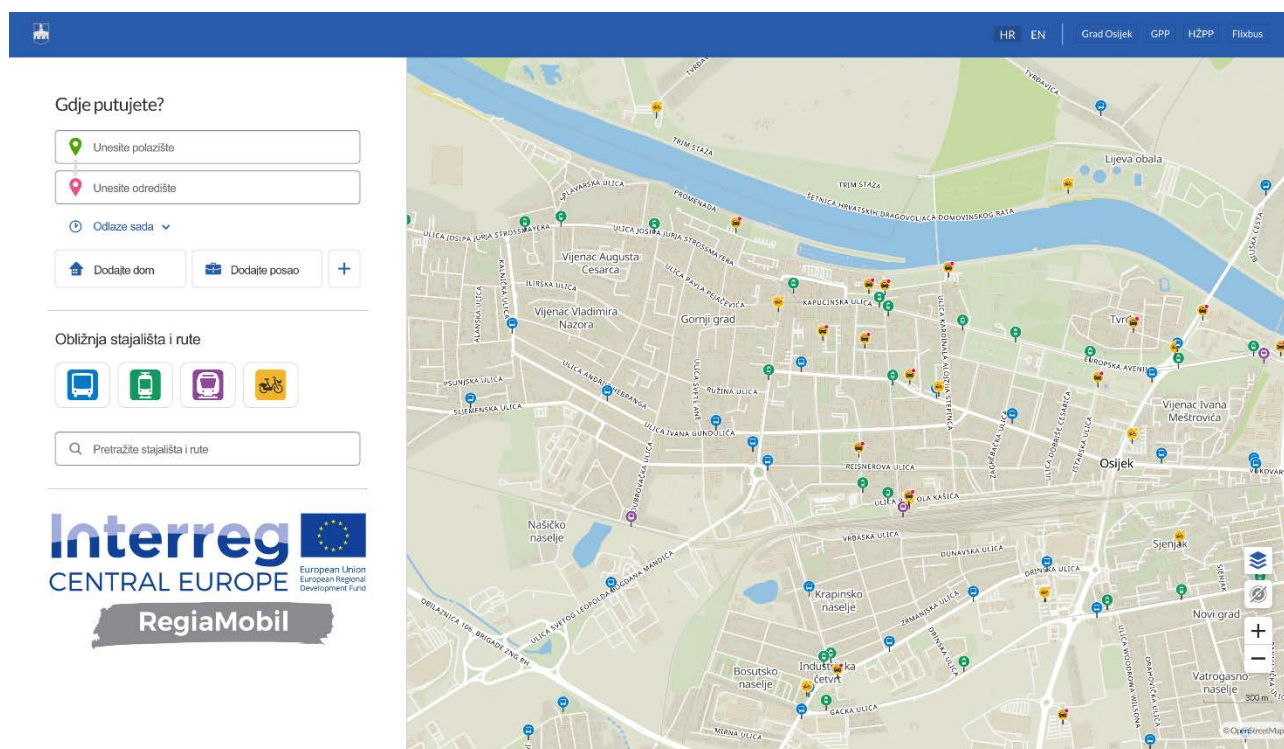
change. Therefore, the current position of public transport in OSUA (consequently also GPP as the exclusive PT operator in the City of Osijek) is not very strong.

Total annual number of GPP passengers oscillated from 2013 to 2021. However, in 2021 the number was the lowest in the considered timeframe.

3. Pilot implementation

3.1. Realization of the pilot

The MMJP was prepared during the REGIAMOBIL project lifetime, but real test could not be conducted due to national legislative challenges, although this will be resolved soon and GPP has the intention to start operating MMJP in Osijek. For that, active communication will be a key in order to know the exact needs and expectations from the users' point of view for the specific areas. During the pilot, active communication was evolved that needs to be used further for the successful implementation. (Figure 2)



2. Figure Landing page of the journey planner

Due to an introduction of new sharing schemes across different municipalities in Osijek-Baranja County such as bike sharing and car sharing, an increase in traditional service replacements with flexible solutions is envisaged (mainly shifting from personal car and bike ownerships towards sharing scheme usage).

Based on usage results and service use satisfaction ratio (different methods used already within the project), multimodal journey planning platform could be extended across different counties in Croatia, thereby integrating different transport providers into one seamless planning platform.



One concrete example for the integration of the KPIs is that daily trips were measured during the testing phase that could be also integrated into defined measures together with the following KPIs:

1. No. of transport planning trips using MMJP
2. No. of kilometres travelled using MMJP
3. No. of travelling sessions using more than one modal option offered
4. No. of multimodal journey options available for use

3.2. Involved stakeholders

Stakeholders were identified according to two criteria:

- a) the role in local mobility (user, service provider, future service provider),
- b) data they can provide on local mobility (existing services, mobility flow).

Selected stakeholders have been invited to join the co-design workshops by email and telephone. Within the first workshop, preferred way of contact was surveyed in order to make sure we can easily follow-up and continue communication with each stakeholder. Following the first workshop, stakeholders were contacted with materials and conclusions of the workshop. They were also asked to provide data and information relevant to the project from their organizations. The workshops were organised to explain stakeholders' role in the project, collect as much data as possible directly from them and to induce creative problem-solving and discussion using different tools and methods.

The stakeholders that were initially identified as the key ones included:

- Local and regional authorities (City of Osijek and Osijek Baranja County)
- Local public transport operator, bike-sharing and car-sharing provider (GPP Osijek)
- Regional bust transport operators (Panturist, APP Požega (Arriva), Čazmatrans Nova)
- Local Taxi Service operators (Osijek Taxi)
- E-scooter provider (Bolt)
- Regional railway passenger transport operator (HŽPP)
- Civil associations representing retired citizens, university students, handicapped persons and persons with reduced mobility, environmentally aware citizens
- Most significant (in terms of generated trips) local employers
- Most significant (in terms of generated trips) public service providers (hospital, university).

3.3. Promotional activities

Marketing channels, promotional materials, realized activities. (300-500 words)

The city of Osijek will develop a strategy and action plan for multichannel promotion of the MMJP through the media and social media (analysis of the situation, setting goals by channels, development of strategies and tactics for individual channels and individual segments, defining a timetable within the available budget, evaluation measures and indicators) instructions called the Project communication toolbox. Implementation of the media campaign following the defined strategic and action guidelines of the plan (1 press conference, 3 press releases). Implementation of the campaign on social media under the defined strategic and action guidelines of the plan (publications on social networks, minimum 1 month).

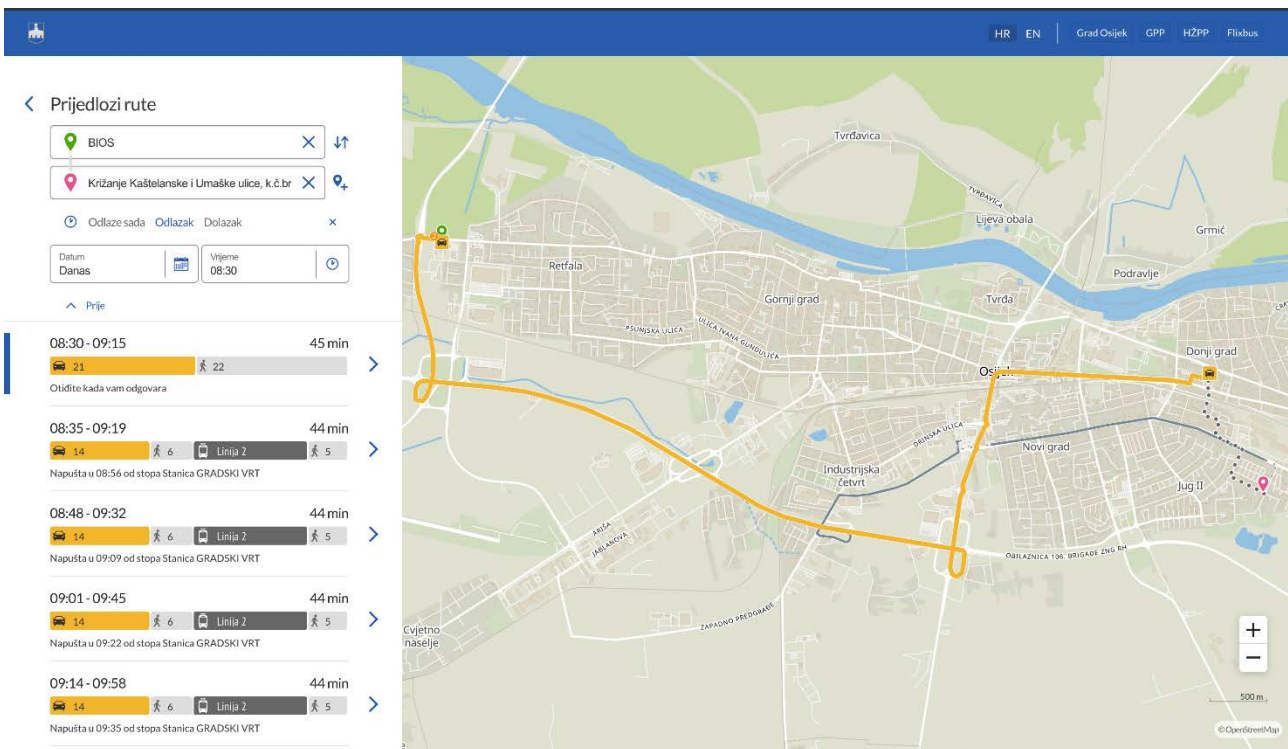


Implementation of an outdoor advertising campaign via an LED display (minimum 2 pieces in frequent urban locations, including visual design and preparation for broadcasting in various video formats, minimum 3000 broadcasts per month (100 per day) per display). Production and distribution of posters and flyers for the promotion of MMJP for the public transport passengers.

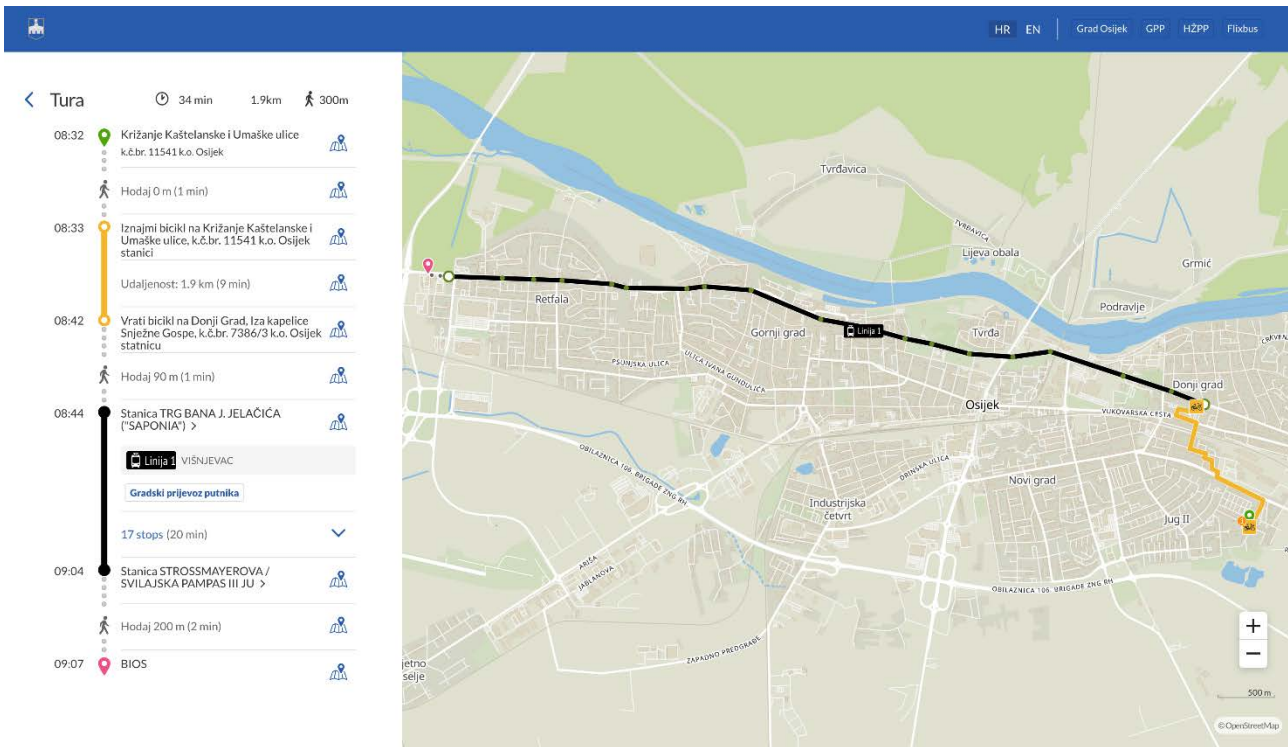
3.4. Final service

The main partner in the creating of multinodular journey planning (MMJP) was GPP, which is public transport operator in the Osijek region, and based on their inputs and experience, we made a reversion of the existing bus lines to ingrate into the shared service (bikes and cars) which is operated by GPP. Also, we took in consideration a new e-scooter which have about 12.000 rides during 2021.

In the further plans we must take in the consideration a new service such as autonomous driving which will be integrated in the MMJP (Figure 3 and 4).



3. Figure Journey planner functions



4. Figure Multimodal journey

3.5. Changes

The success of the ecosystem relies in the engagement of a broader scale of key partners, including other transport operators and mobility providers, expected to join the community in further stages.

At the same time, the scaling up of the solution will rely on the adaptation and replication potential of the output in further cities and communities.

In terms of key activities and resources the scaling up might require marketing and engagement actions in order to promote the developed solutions and integrate mobility providers as key partners, support to the digitalization of mobility data for companies, and support to communities in scaling up the concept in other areas at national and international level. Because of the problem with the public tender procedure for the promotional activities of the MMJP we will extend promotional activities after the official closing of the project. In that way, we will fulfil our indicators but with a delay of eight months.

4. Pilot evaluation

4.1. Evaluation of results of periodic monitoring indicators related the MMJP

- Realization of output indicators

The realization of MMJP output indicators is slightly different than it was previously planned. The indicators related to the service development have been achieved. The testing phases were conducted with a higher number of test users than it was originally planned. Still, due to the Covid-19 restrictions, especially the measures related to public transport, service testing phases have been postponed and accordingly



shortened. The output indicators related to public presentation of the service through different media channels are achieved.

- Realization of outcome indicators

The users got information about the multimodal journey planning tool as a mobility solution which integrates different modes of transport. According to the feedback form users collected during testing phases, the MMJP solution positively impacts multimodality potential and incentives people to use the public transport.

- Realization of impact indicators

By giving information on the public events, checking the opinion of target groups during the implementation and testing phases, it can be concluded that the awareness among the residents about the sustainable transport modes by using the MMJP tool has been raised.

4.2. Target groups

Target group encompass all citizens of Osijek Urban Agglomeration gravitating to the City of Osijek. However, stakeholder engagement process and further analysis showed that the needs of certain age and social groups were not met within the current mobility system, in particular:

- University students

There are around 16.000 students attending courses at the University of Osijek. It is estimated that only 30% of them are permanently inhabited in the City of Osijek. At the same time, these 30% are the only part of student population with a subsidised public transport ticket (subsidised by the City of Osijek), while students arriving from other areas have to pay the full price.

Mobility of students living in more distant municipalities of Osijek Urban Agglomeration often depends on only one bus operator (one line). Where present, railway connections have a low frequency (about 5 daily departures) and low operational speed not competitive to road transport.

Last year operator of e-scooters Bolt started with the service and according to their statistics about 65% of users are students. This result shows that students are very interesting target group for new fallible transport services.

In terms of mobility within the city, cycling is possible for students who live in Osijek (and own a bike there). In case of longer trips with origins outside of the City area, cycling is mostly not an option due to lack of infrastructure (in terms of lanes/tracks and safe bicycle parking).

Bike sharing service is started with operation by end of 2021., and because of wintertime we don't have appropriate data which can shows what kind of users are mostly use this service.

Students need more affordable, diverse and flexible mobility options.

- Elderly population

In case of Osijek, aging of society includes a decrease in number of economically active citizens and students (school and university), thus affecting local mobility patterns.

Aging society sets new requirements for the public transport services, especially in term of accessibility. It primarily includes adjustment of infrastructure and rolling stock, but also changes in tariff system, PT marketing and sales mechanisms, passenger information system etc.

The PT system is currently not adjusted to the needs of the elderly. However, in terms of public transport service provided by GPP, 43% of monthly and annual tickets are sold to the retired users. Nevertheless, total revenues generated within this tariff are 20% lower than the revenues generated by users paying the full ticket price (employed).



Investments aimed at implementation of accessibility measures are needed. However, fares within different tariffs should be more balanced in order not to increase already enormous difference between two tariffs (retired / employed).

- Population of less densely populated municipalities surrounding the City of Osijek

The City of Osijek has tram, bus, and rail transport services available. However, availability decreases with the distance from the City of Osijek. Contracts for the operation of lines through the municipalities in the County are awarded by the County in a tender procedure. However, there is a lack of PT operators' interest for line operation in less populated areas. Therefore, inhabitants of these parts of the County are dependent on their own motorised vehicles. For students and elderly (groups without a valid driving licence) it presents a crucial mobility problem.

4.3. Feedback

User experiences and user patterns aim to provide at one hand a general description of potential evaluation methods of user acceptance to analyse the results of the realized of the REGIAMOBIL pilots as general background. At the other hand it summarizes the performed user assessment activity that have been followed and its results as an evaluation of user satisfaction and feedback collection for the fine-tuning process for the full operation phase.

As the preparation and design phase of the REGIAMOBIL services have been performed based on co-design principles and methodology the evaluation of tested shared and flexible services of the project should be followed accordingly. The involvement of relevant stakeholders to the assessment process of tested new mobility solutions can help the successful fine-tuning for the full operation phase.

The MMJP tool as a new mobility solution which integrates various transport modes has been developing within the REGIAMOBIL project. That means that first setup stages have been undertaken as the part of pilot element in Osijek region. In regard to implement this mobility solutions two testing phases have been conducted. The first phase, beta testing phase, was running among the smaller group of key stakeholders and developers. The purpose of beta testing was to assess the main functionalities and the performance of the tool. During this phase, some fundamentals settings have been improved in order to enable the tool usage for wider group of testers.

Second testing phase, start-up phase aimed to get the feedback from target users among the stakeholders and students in order to fine-tune the service and get an insight in user's expectations in terms of solution improvements. This phase included also a short mobility survey before the start of testing phase and user's feedback during the testing phase.

Finally, full operation phase started right after start-up testing phase. This phase is supposed to end with the end of project where the main focus is to improve the functionalities and operational work according to the user's feedback. Further developments of trip planning tool are shifted to integrate all kind of shared transport services such as bike and car sharing and e-scooters.

4.4. Post-pilot plans

One of the main goals of the REGIAMOBIL project is to create a service hub aiming to link traditional services to flexible and shared services in the demo region by integrating information. With the implementation of the service hub pilots contribute to a transnational output, the service hub has three components and partners responsible for demo sites will contribute to each of them:

1. Component 1: guidelines for cities and regions for the implementation of digital ecosystems and digitalized innovative mobility services



2. Component 2: open-source code developed at pilot level for the different pilot sites, and made available to third parties on a common repository
3. Component 3: guidelines for policymakers and planners on digitalization of mobility services in Osijek urban agglomeration region

Components 1 and 3 will provide the guidance to implement digitalized services at local and regional level. Component 2 will make developed software to be open in order to allow third parties to use it for the implementation of new digital services in their regions (e.g., MMJPr).

It is important to note that the service hub means different in case of each pilot and not all the pilots will produce open-source code for the service hub but will contribute to create the general reports at project level.

Initially, the larger list of public transport operators is predicted to be included in developing the MMJP service. Unfortunately, private operators were not interested in participating in this project as they were not willing to provide their service operating data. So, in this service design process, national railway passenger transport operator and local bus and tram public transport operator, also providers of sharing transport were actively participating. Active participation considers providing relevant operational and organizational service data.

The MMJP Web application has been developed based on Digitransit solution by integrating and configuring service operating data from relevant operators. All the operators that tend to be included in this kind of service should ensure the availability of their transit data. The minimum datasets include the operating geographic information and schedule data. As the provided data are static data (fixed routes and timetables), there is no need for continuously updating. The updates are needed only periodically. The success of the service integration depends on the availability of open mobility data forms.

As above mentioned, the MMJP application is based on static transit data (timetables, routes and stops) provided by three different public transport operators, two public and one private. In order to enable the data integration process, all the data should be prepared as GTFS data formats. Otherwise, the additional pre-integration activities are needed to convert the table date formats into the GTFS files. The current situation in Croatia regarding data formats is not ideal because the digitalization process of transit data, and operational data is underdeveloped in general. All the relevant databases are in the form of excel tables. The same situation was with the local public transport operator in Osijek region - GPP. Within the SHAREPLACE project, GPP's transit data had been configured manually into a GTFS file. Other involved operators provided their GTFS files already configured.

The functionality of the service hub relies on the availability of the external IT experts specialized in the opensource trip planning solutions. Furthermore, it is necessary to ensure infrastructure and technical requirements for service running. As the periodical updates and protentional improvements of service hub are needed, it is crucial to arrange also the maintenance of the service hub. The City of Osijek has engaged the external IT company for the application development including a one-year maintenance agreement.

5. Lessons learned

The main characteristic of new mobility services is its focus on user's needs. That basically means that they are oriented to consumer and designed to meet the consumer's expectations. In order to keep and to enhance user's satisfaction, it is highly recommended to set up the methods for continuous and periodical data gathering which will include user assessment too. In regard to the MMJP tool, the data gathering methodology should include the travel statistics related to the use of different transport modes as well. Furthermore, with the trip planning tool upgrade and development, user assessment tools should be created according to specific criteria, data measurements and analysing processes.



Three main elements must be considered for the scaling up of the model of MMJP:

- The inclusion of a plurality of services and the development of new ones.
- The replication in different cities and communities.
- The opportunity to provide dedicated focused services on a b2b perspective to companies for better managing the mobility of employees and customers, and to mobility providers dealing with the digitalization and integration process.

The cost structure must include those enabling the scaling up, including marketing.

Revenue streams might consider the support to digitalization and customization of the service for specific areas (e.g., business districts, etc.), and the contribution to integration costs by private companies joining the system.

6. Annexes