

## Article

# Designing Mobility Policies for Vulnerable Users Employing the Living Lab Approach: Cases of a Demand-Responsive Transit Service in Ljubljana and Maribor

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**Abstract:** In recent years, transport policy has strongly been oriented to develop more inclusive cities and to design mobility services aligned to specific users' needs. In an attempt to guarantee an adequate level of accessibility, especially to vulnerable users, approaches based on the dialogue between public administration, operators, citizens and researchers (so-called "quadruple helix") have been proposed. The two case studies presented in this article refer to the development of a minibus demand-responsive transport system, devoted mainly to people with reduced mobility, in the cities of Ljubljana and Maribor (Slovenia) designed using a Living Lab participative approach. In fact, urban mobility stakeholders were engaged in this process during the design and monitoring phases of the pilot projects. Their involvement resulted in producing positive outcomes: citizens actively participated in the projects, and the designed service was perceived to be useful and effective. Both projects were successful, as statistics demonstrate, and are expected to be confirmed and strengthened over the next few years.

**Keywords:** Living Lab; participative approach; DRT service; stakeholder engagement



**Citation:** Mariano, P.; Trolese, M.; Kastelec, D.; Bitenc, M.; Jurgec, D. Designing Mobility Policies for Vulnerable Users Employing the Living Lab Approach: Cases of a Demand-Responsive Transit Service in Ljubljana and Maribor. *Sustainability* **2023**, *15*, 14698. <https://doi.org/10.3390/su152014698>

Academic Editors: Xiang Li and Pierluigi Coppola

Received: 7 September 2023

Revised: 5 October 2023

Accepted: 5 October 2023

Published: 10 October 2023



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## 1. Introduction

Developing more integrated and accessible transport services within cities is a fundamental strategy that policymakers and administrations have to implement to reduce car dependency and congestion in urban contexts, as well as to improve citizens' quality of life, as the UN-Habitat program highlights [1]. Transport services should, therefore, be rethought to provide adequate accessibility levels to the most important transport nodes and points of interest. Accessibility must be assessed with respect to different groups of users in the transport service, in particular considering those people with difficulties (i.e., elderly and reduced mobility people) [2]. Interventions can be directed both at re-designing the infrastructure elements—providing continuous and obstacle-free paths [3,4]—or at conceiving services for the community from the perspective of more inclusion—adopting new technologies and digital platforms [5,6]. To account for the necessities of these groups and to provide a service that is aligned with the real interests of citizens, international guidelines suggest adopting a bottom-up approach in the designing phases of this service: the Living Lab is a participative approach that administrations and policymakers should adopt to engage stakeholders, to identify their needs and, therefore, design services that are aligned with users' interests.

This paper presents two case studies of application in a participative decision-making approach, based on the Living Lab concept and stakeholders' engagement, in the Slovenian cities of Ljubljana and Maribor within the perimeter of the European TRIBUTE Interreg project. This project, part of the wider ADRION Programme, invests European funds to

promote integration and dialogue between public administrations and citizens in involved countries overlooking the Adriatic and Ionian seas. In Maribor and Ljubljana, two cities that have been involved in the TRIBUTE project, the active participation of citizens since the beginning of these projects in designing a new on-demand minibus service (Demand Responsive Transport, DRT) has led to its successful implementation. In Ljubljana, the service was developed to help the most vulnerable user groups, such as the elderly and disabled, to travel within the high-traffic area of the University Medical Centre Ljubljana (UMCL) and the Ljubljana Institute of Oncology (IOL). In Maribor, the service was designed to satisfy an increase in travel demand, with the addition of an electric free-of-charge minibus that drives door-to-door between the roads of the historic city centre. The characteristics of these services emerged from the proactive participation of stakeholders in the designing phases of both projects, thanks to the application of the Living Lab approach. In both cases, the final scope was to enhance the accessibility of high-traffic areas for people with reduced mobility. In particular, the aim of this paper is to demonstrate how the Living Lab approach can be used to successfully design and implement transport services that are aligned with the real needs of citizens, particularly those with reduced mobility.

## 2. State of the Art

### 2.1. Participative Approaches for More Accessible Cities

Several actions can be designed and implemented to increase integration and improve accessibility to the main urban centralities and points of interest. To improve the overall accessibility of a certain location, both infrastructure and services can be re-designed to intercept users' needs. Researchers have put into the spotlight the necessity of making more practical measures of accessibility [7]. In fact, these measures can be easily calculated as a property of the urban environment [8], but without taking into account the different personal characteristics, including the cognitive, physical and sensory abilities of users. The necessity, therefore, is straightforward when considering the most vulnerable groups to ensure a more inclusive urban environment [9]. To reach this objective, the European Commission encourages the development of sustainable urban mobility plans (SUMP) based on the active participation of citizens and stakeholders in the definition of the measures to be implemented [10]. The European Commission encourages, therefore, the dialogue between stakeholders on all urban mobility challenges and remarks on the importance of public engagement to highlight citizens' needs, especially those coming from vulnerable groups of users [11]. As highlighted by Booth in his research [12], the integration of vulnerable users in the decision-making process is aimed at critically analysing public services to verify whether they are responsive to different users' needs, reducing, therefore, social exclusion and enhancing social sustainability [13]. Developing more socially inclusive policies, however, always requires negotiations and the definition of trade-off between the interests of different groups: a role that planners and public authorities have to play [14,15].

In recent years, European states and cities have particularly focused on the application of participative approaches, such as Living Labs [16,17], rather than traditional methods; this type of new concept allows policymakers to have an optimal view of the entire process from preparation to implementation and monitoring, by tailoring the participation of users during each step of the process [18]. This novel approach enables strategies to be formulated with an emphasis on attainable objectives, such as (a) economic benefits, (b) non-economic benefits, (c) stimulating participation and promoting partnerships, or a combination of the two. Specifically, the main objective of the first type (a) is to ensure that the proposed transport solution delivers economic benefits to marginalised communities which is not the primary objective of this study. The second category of strategies, specifically those that tackle non-economic effects on the living standards of marginalised communities while also prioritizing environmental and ethical concerns, holds particular relevance in the scenario being discussed. The third group of strategies concentrates on policy and planning reform. These strategies aim to create a more supportive environment through measures such as participatory planning, resident involvement in projects, enhanced

information dissemination, and improved effectiveness of communication, all of which can be developed using inclusive and participatory methodologies. This enables planners to attentively address the population's needs beyond mere economic evaluations, which are typically more straightforward to measure and assess. Living Labs are tools that involve stakeholders in the decision-making process. They can be applied to different contexts thanks to their flexibility and ensure effective results in policy-designing phases [19]. Living Lab is a participative process in which stakeholders communicate and produce dialogue to facilitate the development and implementation of proposed solutions. Living Labs are based on the principles of openness of visions and realism of the proposed solutions [20] and allow all different groups of stakeholders to act in a more synchronised way and achieve the proposed results more successfully.

As highlighted by Zipfel et al. [21], the Living Lab approach works very well in investigating the needs of a diverse population and promoting the integration of various citizens' groups [22] with a particular interest in empowering their mobility in a sustainable way. Public and citizen engagement can be performed through surveys or a series of workshops, as the main European guidelines and projects suggest [23–26]. These instruments allow an understanding of people's preferences and willingness to use proposed solutions and are indicated as an instrument to promote social inclusion. You can employ participatory methods to assess the potential for altering users' preferences when it comes to mode choices. This approach is particularly useful when examining groups of individuals, such as the elderly or those with limited mobility, who might encounter challenges with conventional options.

## 2.2. Living Lab Methodology

Slovenian cities are focusing on adapting the physical urban environment, removing dangerous spots, obstacles, and barriers, and improving access to public buildings, passenger transport and other public spaces. Municipalities' administrations of Ljubljana and Maribor were interested in involving the main stakeholders in the decision-making process following the quadruple helix approach—where citizens, companies, researchers, and public administrations interact, discuss, and cooperate to share, develop, implement, and validate a common plan [27]—during three main phases of the pilot action:

1. Planning—a series of meetings were organised with the public and private authorities involved in the project (i.e., local and regional authorities, city infrastructure and public service companies). These types of stakeholders knew the current state of this network and were able to give important opinions on possible improvements for routes and mobility. Since they had first-hand information on what passengers were demanding, they were able to stress real mobility needs by proposing targeted solutions to specific groups of people.
2. Implementation and Monitoring—in this phase, the future users were included in the process, and their opinions and suggestions about the equipment were collected.
3. Validation and Review—Living Lab was discussed with stakeholders to coordinate all elements necessary to test the delivered equipment and discuss the results. Opinions and recommendations were collected during the testing, were reported in written documents, and considered for future developments.

The general approach of Living Lab is described more in detail in the following paragraphs, according to the specific case study of its application, and was used to investigate the willingness to use new DRT services in the cities of Ljubljana and Maribor. Public DRT services were designed considering their differences from usual regular bus services, which stressed the functionality of the service and the context in which it is implemented [28,29]. Differently from regular services, DRT systems do not rely on fixed lines and routes, presenting additional problems related to the optimisation of the demand–supply interaction [30,31]. Several models and algorithms have been developed to solve this problem [32], but mismatches between the theoretical modelling of the service and real users' perceptions often arise [33]. Furthermore, there is a necessity to develop more qualitative methods to

assess the specificities of areas in which the DRT service is provided [34] and to increase users' perceived utility of the service [35]. Living Labs and participative approaches can, therefore, help in overcoming these issues, allowing the identification of target areas for the service and the real users' needs. One of the major concerns with the use of Living Labs is the fact that it remains difficult to involve citizens in participating in events and workshops due to a natural bias toward this type of public initiative. With the aim of gaining greater acceptance from the population, one strategy is to make participation in Living Labs more attractive by making it short-lived, offering the option to participate remotely, or even proposing a financial return. Using these solutions, as Brohmer et al. pointed out [36], there is a risk that Living Lab participants belong to specific categories and do not represent the entirety of classes of potential users.

The new additional public transport service designed in Ljubljana and Maribor with the Living Lab participative approach aimed at providing greater accessibility to low-mobility people who find it difficult or impossible to use conventional public transport. In Slovenia, in fact, nearly 45% of the population is classified as belonging to a vulnerable road-user group, and this percentage is expected to increase over the years due to the aging population [37]. The provision of equal opportunities for reduced-mobility groups is currently regulated in Slovenia via the Act on Equalisation of Opportunities for Persons with Disabilities (ZIMI), in the provisions on the use of public transport by road and rail and in the Convention on the Rights of Persons with Disabilities (accessibility, Article 9, and personal mobility, Article 20), as well as in Regulation (EU) No. 181/2011 on the rights of passengers in bus and coach transport and in Regulation (EC) No. 1371/2007 on the rights and obligations of rail passengers [38]. To promote integration, a DRT service was designed and implemented in the cities of Ljubljana and Maribor. DRT services represent a solution that has been tested in different contexts with different outcomes. In Calhoun County (U.S.), there is a privately operated service that receives funding from the public administration. This service underwent a 12-month trial period, which was subsequently extended for an additional 12 months due to the strong interest expressed by the community [39]. Similarly, in the urban areas of the West Midlands (U.K. an on-demand door-to-door service is in operation for people; with more than 12,000 trips per month, this service obtained financial subsidies from the government [40]. Another DRT service was implemented in the Denbigh, Pembrokeshire, and Conwy Valley rural areas of Wales (U.K.) in 2020. Positive feedback has been received by users [41]. Paris (France) also adopted a shuttle service for people with reduced mobility; this service counts more than 25,000 trips per month [42]. Brescia (Italy) tested the implementation of a new on-demand bus service for people with reduced mobility, but without any success, the service was withdrawn [43].

### 3. Case Studies

#### 3.1. TRIBUTE Project

Maribor and Ljubljana pilot actions are part of the wider TRIBUTE project (“inTe-gRated and Innovative actions for sustainaBle Urban mobiliTy upgrade”)—financed by the European Commission—aimed at sustaining the development and the integration of the Adriatic-Ionian (ADRION) region. The ADRION region includes eight countries (both EU and non-EU State Members), namely Albania, Bosnia and Herzegovina, Croatia, Greece, Montenegro, Italy, Serbia, and Slovenia. The scope of the TRIBUTE project is to increase the overall accessibility and connectivity of the ADRION area by developing an integrated transport infrastructure, promoting the digitalisation of services, as well as to support the green transition, and reducing social disparities between the involved countries.

The regions involved in the TRIBUTE project are, therefore, pioneers in developing and applying policies and pilot actions to cope with mobility problems that are accentuated and faced by most cities in Europe. TRIBUTE is part of the wider EUSAIR (EU Strategy for the Adriatic-Ionian Region) yellow pillar, which is a sub-task of the ADRION Programme [44]. ADRION Interreg is a transnational programme funded by the European Commission that involves several countries—Figure 1—with the scope of sharing experiences and

improving cooperation between the regions of the Adriatic-Ionian area by acting on four main pillars. The specific pillar in which the TRIBUTE project takes place aims at developing intermodality and connectivity for passengers and freight between the hinterlands and main transport nodes [45].



**Figure 1.** Adriatic-Ionian regions involved in the EUSAIR (Source: EUSAIR website).

### 3.2. Application to Ljubljana Case Study

#### 3.2.1. Context

The Interreg ADRION Programme included the City of Ljubljana as an active participant. Among its collaborators, Ljubljana embarked on the project's pilot action "Innovative public transport services", focusing on the advancement of forward-thinking public transportation services. The TRIBUTE initiative in Ljubljana represents an expansion and migration of a pre-existing free-of-charge, on-demand public transport system successfully deployed in the central pedestrian zone of the city. This service has been launched since 2009 within the CIVITAS Elan project [16], initially utilizing two electric vehicles named "Kavalir" (Gentlemen). The service presently grew to encompass a fleet of seven electric vehicles (comprising five open and two enclosed vehicles), accessible throughout the year.

Like other European urban centres, Ljubljana is encountering the challenge of an aging population phenomenon. The core focus lies in analysing its implications on the demand for inventive and modern mobility solutions. The Ljubljana pilot initiative strives to introduce an upgraded transportation service that efficiently adapts to the changing behaviours and necessities of Ljubljana's inhabitants and tourists, with particular emphasis on vulnerable segments like seniors and those with physical or sensory limitations. This initiative was implemented within the high-traffic area of the University Medical Centre Ljubljana (UMCL) and the Institute of Oncology Ljubljana (IOL), targeting those specific user groups. The central objective of the Ljubljana pilot action covered collaborative planning, creation, execution, monitoring, and validation. These goals were realised through the engagement of key stakeholders, coordinating events, publicizing broadly, conducting interactive workshops, and executing a user satisfaction survey.

### 3.2.2. Development

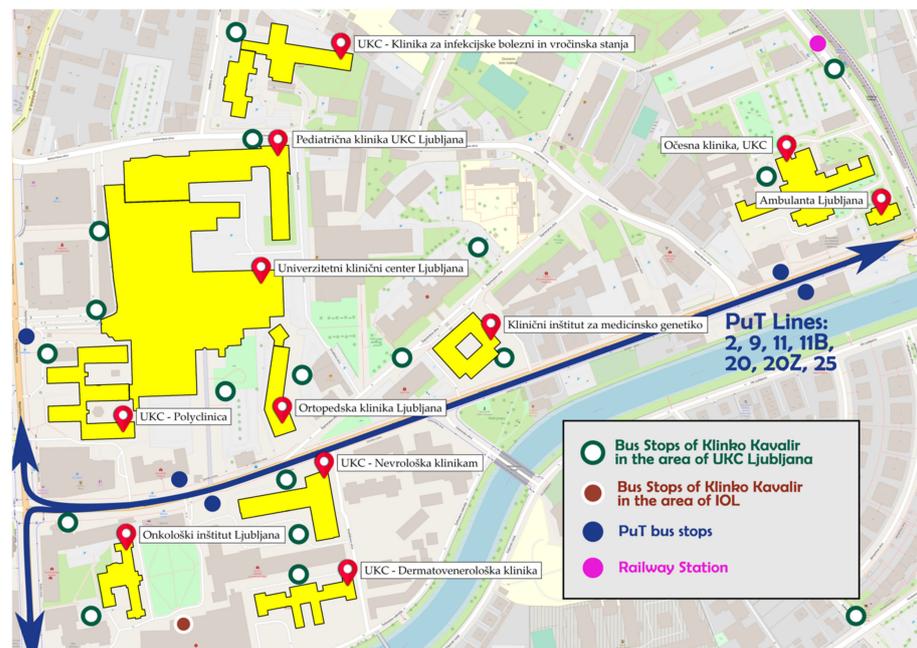
In the process of stakeholder engagement, a focus meeting of Ljubljana's Living Lab was organised, primarily aimed at unveiling the undertakings of the TRIBUTE project. The focus rested on the pilot public transportation service and underscored the pivotal role played by the City of Ljubljana in the project. Participants were actively invited to contribute their viewpoints, anticipations, and aspirations, fostering the collaborative shaping of the envisioned service. Concurrently, interviews were performed to delve into user perspectives on this service. Collected data included information on the origin of travel to the pilot area, transportation preferences, user satisfaction levels, and constructive suggestions for service enhancement. This project has been structured following the three-phases framework proposed by the Living Lab approach, each one of which is set to be completed in cooperation with different key figures other than the city of Ljubljana.

In the first phase of this project, during the process of stakeholder engagement, a series of Living Lab meetings were organised with the purpose of presenting TRIBUTE's main project activities, focusing on public transport services and the role of the city within the project. Participants were invited to co-create the service by suggesting opinions and ideas but also expectations and wishes. The first Living Lab meeting with stakeholders took place in Ljubljana City Hall on 15 December 2021. The purpose of the kick-off event was to present the project to the stakeholders and start the implementation of Living Lab by first discussing actions that would be useful to enhance the public transport service's efficiency. Representatives of Spominčica—Alzheimer Slovenia Association and the Slovenian Association for Dementia—rated the service as potentially very useful, suggesting an increase in the fleet once the project had been tested and assessed. The Association of the Deaf and Blind highlighted the challenge of communication between deaf/blind/mute people and the driver of the "Kavalir". A possible solution found was to implement a new system of service booking via SMS. A series of meetings were also planned with the drivers, who must be aware of their task and must be prepared for all kinds of situations that the transport of elderly and disabled people may result in. The drivers underwent standardised training regarding qualifications, friendliness, and professionalism; at the same time, ad hoc workshops were implemented for the handling of people belonging to vulnerable groups. In the first set of workshops, the drivers were familiarised with the service area, its accessibility, and obstacles; in the second set of workshops, the drivers were familiarised with the management of people at risk, learning how to interact with them. Drivers also played a very important role in terms of direct feedback from users, who could express their comments directly during the journey and ask drivers for information, such as other transport possibilities, clinic locations, or other buildings and locations near the area.

In order to cope with the proposed phases, it was crucial to present to the UMCL, IOL and the City of Ljubljana the aims of the public transport service to reach common agreements on the appropriate requirements, permits and procedures, such as: stops in which the service can enter and exit the area in agreed area points, all types of information tool installations, like billboards, signs and benches at the stop areas, a list of the clinics from which it is possible to conduct a door-to-door type of service, scheduled operating times, and various other areas. Stakeholders identified during the initial stages of the project were informed of the new service in the pilot area through the mailing of the TRIBUTE brochure "Klinko KAVALIR" and were invited to participate in the Living Lab through the Living Lab kick-off meeting and the following workshops.

### 3.2.3. Implementation

In agreement with the key stakeholders (UMCL, IOL and Ljubljana's transport service providers), the exact pilot area was defined by taking into consideration visitors from all Slovenian regions not completely familiar with the city of Ljubljana. The pilot area is composed of 10 main buildings of the two entities, scattered in a small area, in which the longest distance from one building to another is no more than 1 km—Figure 2.



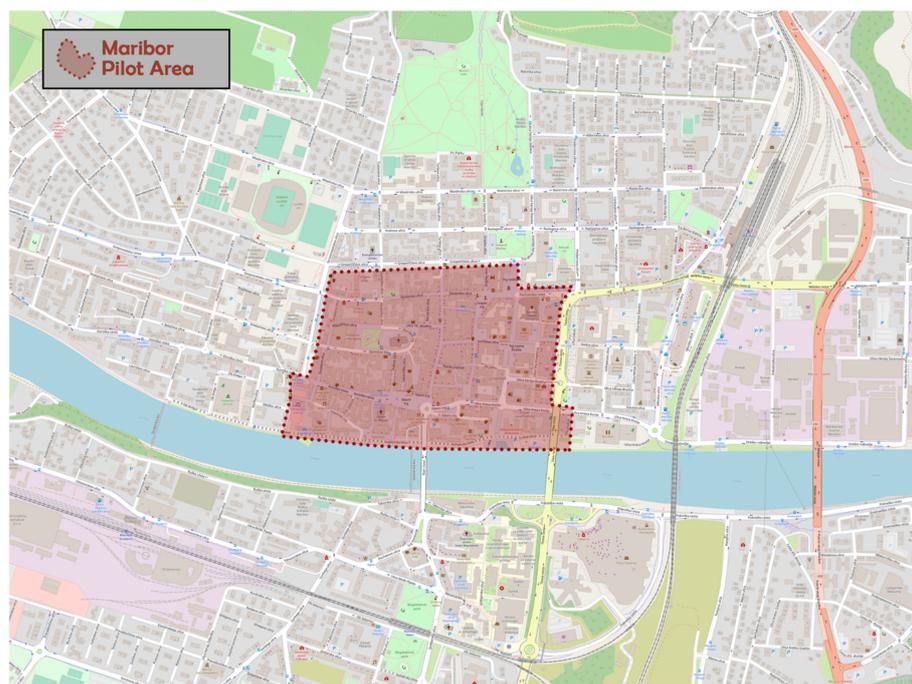
**Figure 2.** Ljubljana pilot area, buildings involved and location of the stops.

A total number of 23 stops (Figure 3) for the “Klinko KAVALIR” public transport service was agreed to be placed in the pilot area, though the drivers still had the possibility to receive requests for door-to-door access to all facilities in the area. All the stops were equipped with information boards before the start of the service, including the service’s call number to which the user could order the service, the names of stops (name of the building or clinic) and all the logos of the involved parties.



**Figure 3.** The minibus used to test the service, named “Klinko KAVALIR”.

In terms of preparation, installation, and the deployment of other equipment, the minibuses were also equipped with an exterior design, including TRIBUTE and key stakeholder logos and the call number, TRIBUTE billboards, information signs on all inbound and outbound public transportation service stops, printed local brochures with a map of the pilot area, and all useful information about the service. The vehicles were equipped with a low entry platform and sliding doors to facilitate wheelchair entry and exit (Figure 4). For sensory-impaired individuals, there was also the possibility to travel with their companions.



**Figure 4.** The centre of Maribor with the pilot area in evidence.

The team of drivers for the KAVALLIR electric vehicles was composed of 21 experienced, well-known and sympathetic drivers. The service of the “Klinko KAVALLIR” operated daily from Monday to Friday, in two shifts, between 6:30 a.m. and 7:30 p.m. The vehicles were able to transport up to five passengers, allowing the accommodation of one wheelchair passenger or a stroller. The vehicles are operated by calling a specific phone number or by direct request to the driver of the vehicle (by raising one’s hand), thanks to its reduced maximum speed of 25 km/h. The pilot action was launched on 1 July 2021 and after some time, a testing phase was conducted: over 10 days between 15 November 2021, and 1 December 2021, a survey was conducted onboard the vehicles to collect users’ perspectives about the service’s performance. The aim of the questionnaire was also to define a class of service users and understand whether the methods used to publicise the service had worked. The time available for interviews was short since they were conducted to the actual users through vis à vis questions on board the vehicle. For this reason, interviewers preferred to administer a short questionnaire to the passengers, which was mainly composed of open questions and ran out over the duration of the trip so as not to negatively affect the user experience. A total of 114 people were interviewed, collecting information on their trip start and end locations, their trip purpose and their overall satisfaction and comments on the experience.

### 3.3. Application to Maribor Case Study

#### 3.3.1. Context

The city of Maribor stands at a crossroads of transformation, with the objective of reducing its reliance on cars and enhancing citizens’ quality of life [46]. In 2009, the municipality of Maribor took an important step by establishing the Council of Disabled. This move aimed at streamlining operations in the disability services sector. A year later, the Council of the Disabled evolved into a consultative body of the mayor, signifying the city’s commitment to inclusivity. Within this broader effort, the municipality adopted an action plan explicitly designed to enhance equal opportunities for disabled individuals within the city. This plan did not overlook the mobility aspect, which is crucial for individuals with disabilities, particularly wheelchair users. The purchase of a new electric minibus marked a significant milestone in the pursuit of these mobility goals. The aim was to provide disabled

individuals with a vehicle specifically designed to facilitate their movement throughout Maribor. This project was part of a broader strategy aimed at promoting multimodal transportation in the city. To ensure adequate levels of accessibility and the user-friendliness of minibuses for all residents and visitors, several key actions were outlined:

1. Online accessibility information—Information regarding the availability of the minibus within the city centre has been made accessible online. The web platform highlighted the service's cost-free nature and emphasised the type of service (door-to-door) offered in the city centre.
2. Easy contact—To enhance accessibility, the minibus operator's website prominently displayed a contact telephone number. This information clarified that the service was available on demand, allowing passengers to stop the minibus during its route and specify their destination.
3. Targeted audience—The minibus service primarily targeted city centre residents, senior citizens, individuals with reduced mobility, parents with young children, and tourists.

### 3.3.2. Development

The Living Lab framework was categorised into three main phases, deeply engaging stakeholders during the multiple sections of the project. During the first phase of Co-Planning, stakeholders were grouped into two meetings. At the first meeting, local public authorities, regional public authorities and city infrastructure and public service companies were present as players aware of the real situation of demand and supply. Meanwhile, a second meeting was held with the stakeholders to discuss the proposed measure package and to present the implementation process. Stakeholders presented good practices to be potentially transferred to Maribor. At the event, stakeholders shared their thoughts about their potential willingness to use alternative modes of transport, such as public service transport through the city centre. Living Lab events showed a broad willingness toward sustainable mobility or alternative mobility modes among those moving through the city centre. The survey implemented as part of the Living Lab provided insights into stakeholder's views and suggestions. Stakeholder engagement through Living Lab resulted in the identification of measures that were implemented during the testing phase. Once the measures to be implemented were selected by the stakeholders, to achieve the development of the pilot action, it was key to proceed with the development of the actions intended to support the planning of the chosen measures. Being able to discuss together with different types of stakeholders on a common topic (e.g., public transport providers, disability associations and nursing homes) and being able to understand how each group responded from their own point of view to the solution of the same problem was an extremely useful and important practice for the success of the project.

### 3.3.3. Implementation

Once the development phase was complete, the city successfully purchased the mini vehicle, which was intended to circulate in the pedestrian area and the narrow city centre of Maribor at approximately 0.5 km<sup>2</sup>, completely located north of the Drava River, between the Sodni and Vodni towers (Figure 4). The minibus was able to access the city centre, where routes were closed for general traffic and practice a door-to-door type of service, moving passengers between any point inside the assigned area.

The vehicle was able to accommodate up to six passengers at a time and was equipped with all the necessities for elderly and disabled people. The exterior design of the minibus was conceived to attract the attention of passers-by, with bright colours and a telephone number with which the minibus drivers could be called to reserve the vehicle (Figure 5). Reservations were made by a show of hands in the street or through the website of the city's public transport provider, where there was additional information for residents, the elderly, parents with children and people with physical disabilities. The website also contained information regarding the operating times: from 8:00 a.m. to 8:00 p.m. every day, including

weekends and holidays throughout the year. The testing period was carried out in 2023 between January 1st and the end of March of the same year.



Figure 5. Maribor minibus vehicle.

#### 4. Results and Discussion

The survey conducted in Ljubljana during the testing phase showed very promising results both in the reception and usage of the newly proposed service. Among the 114 total users interviewed (61% female, 39% male), the vast majority were elderly people in age groups above 60 years old, covering 70% of the total users—Figure 6a. 67% of users found out about the KAVALLIR service in various clinics of the University Medical Centre Ljubljana and the Institute of Oncology Ljubljana, rather than information on billboards, brochures or directly in the streets—Figure 6b—meaning that the service could be further enhanced to reach more and more travellers. The service also performed well with regard to the dissemination of users' place of origin and experience in using the service. Users were split in half between inhabitants from Ljubljana and other parts of Slovenia, and two-thirds of them used the service for the first time. The service was well perceived by those who did not necessarily know it beforehand, coming from outside the city, and thus, were not involved in the stakeholder engagement process. The high percentage of first-time users highlights the friendliness of the minibuses and the drivers, which was well perceived by the people passing by, letting them engage with the service offered.

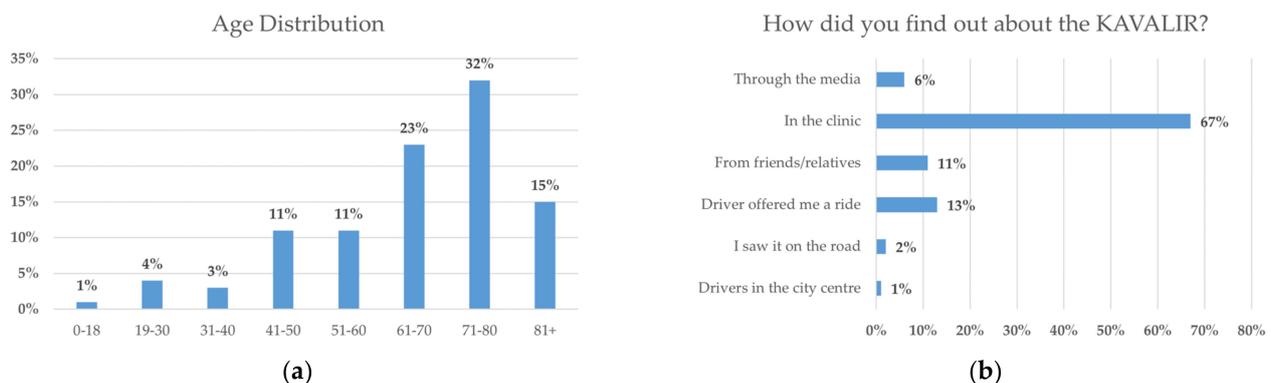
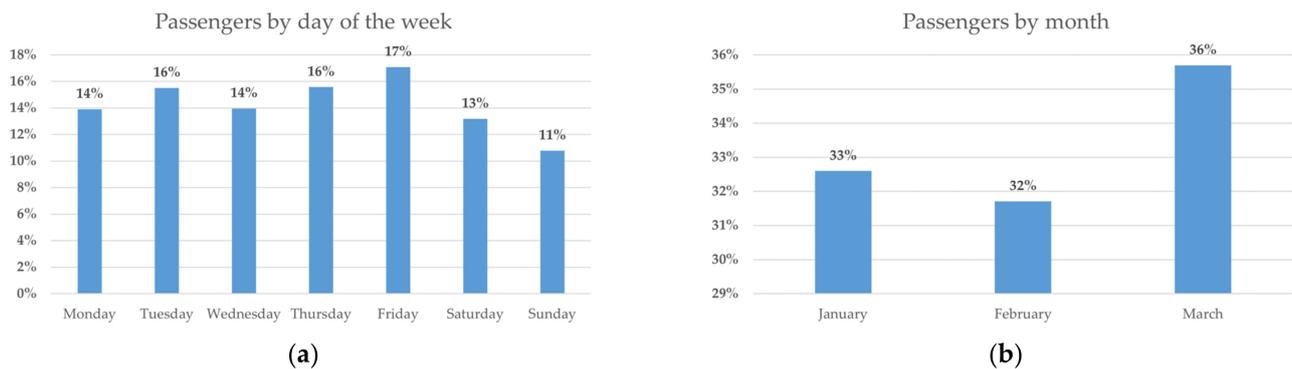


Figure 6. (a) Survey age distribution; (b) How users found out about the service.

The service seemed promising and performed well when also looking at the general numbers of passengers: 20,475 users on call from 1 July 2021 to 31 May 2023, averaging more than 29 people per day during the 699 days of service. The minibuses travelled for a total of 29,101 km during the 2-year period, indicating a low ( $\sim 0.7$  pax/km) index of passengers per kilometre, suggesting that the service was mostly used by single users that had to travel inside the area covered by the service. All users were very satisfied with the service, especially praising the extreme friendliness and professionalism of drivers. Almost all users rated the availability and quality of the service with the highest score, describing the service as great, practical, punctual, fast, and very user-friendly to the elderly. The most important recommendation of the users was that the service should remain in operation even after the end of the project and that at least two vehicles were needed for the service.

In the case study of Maribor, a more detailed assessment of the passengers was performed during a less extensive operating period, from 1 January 2023 to the end of March 2023. The minibuses transported a total of 2705 passengers, averaging more than 30 daily users. The service, although being used in the city centre, averaged more passengers during weekdays rather than weekends, with peaks on Friday—Figure 7a. It was also preferred during the morning shift, from 8:00 a.m. to 12:00 p.m., which collected 53% of trips. The vehicle covered a total of 2453 km, indicating an index of passengers per kilometre (pax/km) of 1.1, despite the vehicle capacity of six people, and operated mostly in the month of March—Figure 7b.



**Figure 7.** (a) Passengers by weekday; (b) Passengers by month.

On average, the total operative expenditures for the services—given the number of served passengers and travelled kilometres—were in the range of EUR 3.0–3.5/pass km.

Data collected from the minibus showed that the vehicle was mostly occupied on weekdays mornings when it transported elderly people to the main city market, choosing an appropriate route based on the distance and the route it had to travel. The minibus had more passengers on days when pensioners received their pensions, driving them to the banks.

The minibus has been very well received, especially by the elderly and physically impaired, who were very satisfied with the vehicle. Drivers were choosing the shortest possible route to the desired location depending on the demand and the number of passengers, but they were open to considering passengers' suggestions on the route they wanted to travel. This made the experience more personalised, with the route not fixed and passengers satisfied. Fixed routes would mean more stops for the vehicle, which would result in people driving longer to reach their destination, as these routes would most likely cover a larger part of the city centre. When the vehicle was free from passengers, it also occasionally made deliveries for a boutique shop in the inner city, as internal combustion engine delivery vans have restrictions in accessing the pedestrian zone.

### *Service Perception*

Implementing an on-demand, free-of-charge public transport system served the primary goal of improving accessibility for the elderly population. To assess its effectiveness, various factors that influence convenience and suitability for seniors were considered. In the Ljubljana case study, these included the proximity of pickup and drop-off points to healthcare facilities, the ease of requesting the service, its availability during peak hours, and affordability. Looking at Maribor, important factors were the overall availability of the minibuses and their possibility to reach any point in the pilot area as fast as possible.

The selection of the municipal operator of public passenger transport to manage the minibus services was crucial from a technical standpoint. The operators possess the necessary expertise and experience to handle such a venture. Their existing infrastructure, including suitable premises for equipment storage, was readily available. Moreover, they had a team of trained drivers familiar with this type of vehicle, eliminating the need for additional technical staff training. As might be expected, the average user's response was at first reluctant to the innovative new solution, which, however, quickly caught on through the drivers' efforts to inform and publicise this service to passers-by. This aspect, as also pointed out by the "flectsi" project [41] in rural Wales, is not to be underestimated when designing an innovative service aimed at a primarily elderly user base: the role of the driver is central to the user experience.

Beyond these technical aspects, evaluating the demand for this service among the elderly was essential. Data collection included tracking the number of elderly individuals using the transport system and gathering their feedback and satisfaction levels. The result is a system that operates smoothly, ensuring reliability for elderly users and providing a lifeline for accessing healthcare facilities and for moving through the city centre.

Feedback from elderly users proved invaluable, as it allowed the service operator to identify areas for improvement. This feedback-driven approach led to the consideration and implementation of necessary changes, enhancing overall accessibility for the elderly. Importantly, this commitment to continuous improvement ensured the sustained success of the minibus service even after the project's completion. Using a survey to evaluate service perception and overall user experience, as conducted previously in the "On demand" project in Brescia [43] and the Ljubljana case study under review, this proved to be a good practice in the Living Lab approach. Users had the opportunity to evaluate and comment on the service after testing and using it, in some cases, several times. This practice makes users aware of what the areas for improvement may be with sufficient experience and knowledge of the service.

## **5. Conclusions**

The experience gained by providing a service in a specific area from these two case studies can be transferred to other cities within the Slovenian region in order to contribute to the goals of sustainable mobility and public passenger transport, as defined in the Strategy for the Development of Transport in the Republic of Slovenia until 2030. Moreover, this methodology could find potential applications in developing user-centred services and urban districts [47], providing the needed services that citizens can access in a walkable or cyclable distance (i.e., "15 min city" concept) [48,49]. These proposals could be emitted by the local public authority or local public transport provider, and the protocol for organizing the mobility measures in the city could be structured in the following way:

1. Definition, selection, and communication from the public authority in coordination with the local public transport provider with the measures that best suit local contexts for local mobility plans is necessary. This step needs to be taken after consulting citizens through a survey and establishing a dialogue with the mobility stakeholders that are directly implementing the measures. The selected measures may be revised or complemented periodically in order to improve the measures and increase or decrease them whenever necessary.

2. Coordination with the local public transport provider to reach the users of public transport and notify them about all the alternative mobility measures that could be implemented in the city is important. This should be published on the municipality's and public transport providers website.
3. The implementation of a systematic public communication campaign to raise awareness about the measures that could be enforced that may not be yet well known by the public is essential.

Following a protocol is important to ensure the consistent implementation of the selected measures within mobility planning. It is also important for the on-demand service operator, in order to manage the minibuses after the end of the project and beyond to ensure the consistency and continuity of the implementation of these measures.

In Ljubljana, the free of charge on-demand public transport has been co-financed under the TRIBUTE project until December 2022, but since it has been proved to be very successful and has shown the need for its continuation, at the end of 2022 the City of Ljubljana and the key stakeholders of this service have agreed to co-finance the service until the end of the TRIBUTE project and beyond. Also, Ljubljana's TRIBUTE Living Lab is not finished yet and the objective is to continue monitoring the suggestions and improvements received from service users and to eventually extend the service area, including other vehicles in the rolling stock.

As far as the city of Maribor is concerned, there may be a possibility to expand the service, given that the area next to the Drava River is currently being renovated and under construction and could have limited access to vehicles after renovation. Therefore, it is currently under study whether to extend the route of the vehicle, which could also run in this area after the construction work is completed, in compliance with the current key strategic documents of Maribor municipality, such as the Integrated Transport Strategy, the Sustainable Urban Strategy, the Local Energy and Climate Concept.

Living Lab is a participative approach that was time and energy demanding, requiring negotiation skills, especially when the interests of different groups were conflicting, when groups disagreed or were not supporting the initiative in a constructive way. These two case studies in the pilot cities of Ljubljana and Maribor are a significant milestone in the future application of this approach. They demonstrate that, despite the challenges of stakeholder engagement, the Living Lab approach can be used to successfully design and implement transport services that are aligned with the real needs of citizens, particularly those with reduced mobility. The Living Lab approach has clear benefits in the understanding of the needs and expectations of different stakeholder groups, facilitating the alignment of common interests and the necessities among them. Moreover, it supports the development of innovative and effective measures, leading to a common level of satisfaction among groups (e.g., group representatives and public transport operators). These benefits are essential for the successful implementation of complex and innovative projects, such as the development of new transport services.

The success of the Living Lab approach in Ljubljana and Maribor is a positive sign for the future. It suggests that this approach can be used to develop and implement more user-friendly, accessible, and sustainable transport services in cities around the world.

**Author Contributions:** D.K., M.B. and D.J.: Conceptualisation, Data curation; Methodology and Validation. P.M. and M.T.: State of the art, Formal analysis, Methodology, Visualisation and Writing—original draft. All authors have read and agreed to the published version of the manuscript.

**Funding:** This publication has been produced with the financial assistance of the European Union. The content of publication is the sole responsibility of the TRIBUTE partnership and can under no circumstances be regarded as reflecting the position of the European Union and/or ADRION Programme authorities. This study has been carried out within the framework of TRIBUTE Project (ADRION 1239—CUP: D45H20000190004—<https://tribute.adrioninterreg.eu/> (accessed on 4 October 2023)) supported by the INTERREG V-B Adriatic-Ionian ADRION Programme.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data are available on reasonable request from the corresponding author.

**Conflicts of Interest:** The authors declare no conflict of interest.

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