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Report on the establishment of the Mobility Alliance and the multimodal mobility platform

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Abstract

This implementation status report provides an overview of the measures which have been developed and implemented regarding a Mobility Alliance and a multimodal mobility platform since December 2012 as part of measure A3.1 “Mobility Alliance” in the project CIVITAS DYN@MO.

This report describes the Mobility Alliance and the multimodal mobility platform in detail and covers the developments which took place in the course of the project duration. This includes listing the activities as well as their development processes and results. The accompanying scientific research conducted detailed evaluations to assess the measures. This primarily includes determining the effects and success of the mobility project. The forthcoming internal Working Document “Evaluation of the Mobility Alliance pilot phase and the mobility platform” will describe these results in more detail. In addition, the challenges which arose during the course of the project are listed and the ways to meet them are described in more detail.

Project Partners

Organization	Country	Abbreviation
AVV	Germany	DE
cambio Aachen	Germany	DE
ASEAG	Germany	DE
City of Aachen	Germany	DE
StädteRegion Aachen	Germany	DE
FH Aachen	Germany	DE
RWTH Aachen (ISB)	Germany	DE

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1 Introduction

The overall aim of measure “A3.1 Mobility Alliance” within the EC-co-funded CIVITAS DYN@MO project is the implementation of an intermodal, web-based information and routing system and a Mobility Alliance in a pilot phase which contribute to a more sustainable traffic.

This comprehensive approach and joint effort of mobility will ensure a better air quality within the City of Aachen and StädteRegion Aachen, and that residents and visitors are encouraged to use alternative transport modes. The objective is that in the future there will be fewer motorized trips.

This report gives an extensive insight into the elements that were developed and implemented (or are about to be implemented) within measure “A3.1 Mobility Alliance” of the CIVITAS DYN@MO project. The key objectives and tasks of the measure according to the project’s Description of Work are:

- The strengthened cooperation of urban and regional mobility service providers in order to jointly develop comprehensive, easy to use, affordable and attractive transport services for the customers
- The elaboration of a “Mobility Alliance” concept including a role and business model and new tariffs as the basis of a future financially secured alliance of all mobility providers in Aachen in the long-term
- The creation of a uniform, intermodal – wherever possible cross-border – information platform for all mobility service providers in an urban area. Users must be able to access, for example, public transport timetables (real-time) (see measure A3.2) and fares, fault reports in the motorised personal and public transport network, availabilities in the car-sharing or commuter rides sector, etc.
- Integration of new services for the client (suggestions, questions and complaints)
- Break down existing barriers for customers: no complicated fares, easily understandable settlement of mobility costs, easily accessible and clear mobility information, etc.

First of all this report describes the idea behind a Mobility Alliance in the Aachen Region, covering also previous developments to show the background and preconditions. A market analysis is then presented which was conducted at the beginning of the project to define the target group and its potential. Moreover, a potential business model is described consisting of (1) Tariffs and multimodal product bundles, (2) Organisational model and technical platform and (3) Financing and workflow model.

Furthermore, the elements which were developed and implemented during the project in close cooperation with the project partners and others are described. These include an intermodal, web-based information and routing system and a Mobility Alliance in a pilot phase for test users. In addition, usage statistics of the test users and the main results of the tes user survey are presented.

These elements give both incentives to switch to environmentally friendly transport modes and make individual private transport less attractive. These efforts shall lead to a more environmentally friendly, sustainable traffic.

2 Background

2.1 Developments in the mobility segment

For some time by now, a significant improvement of flexibility in the choice of the means of transport could be noted in the region of Aachen – especially for the younger generation – even though owning and using a car of one's own has been a fixed part of the logic and orientation of the transport policy. One's (own) car as a status symbol and the first choice for satisfying personal mobility needs is being questioned more and more. However, not only the population's attitude toward mobility is evolving, various new developments and trends are also currently characterising the mobility market. This includes numerous challenges in transport, environmental and regional policy, the further development and preparation of new kinds of communication and information technologies, as well as the increasing offer of alternative mobility services.

Therefore, the basic conditions, the already harmonised public transport offers (buses and railways) with different additional mobility services (such as car sharing, bicycle rental systems or taxis) are provided for networking these offers in an innovative way within the scope of a comprehensive, integrated mobility concept. This is bearing in mind that the diverse offers of the public short-distance transport, car sharing, bike sharing or taxis, and in particular also the offers of service providers in the electric mobility segment (vehicle rentals and charging infrastructure), which form a point of convergence between the transport and energy systems, have not been networked comprehensively until now, so that (potential) customers currently have to use different, self-contained systems for obtaining information, booking and billing. Consequently, neither the utilisation nor the climate protection potentials of said mobility offers can be drawn on to even remotely full extent.

A coordinator or integrator in the Mobility Alliance ensures the organisational and technical networking of the different mobility offers. Among the key tasks in this regard are the conceptualisation and coordination of the different mobility offers and services, as well as the implementation of a multimodal mobility platform via which different processes (information, booking and payment processes, system access, billing of services) can be executed in an integrated procedure.

This harmonised offer marketed jointly from one source has the capacity to generate manifold benefits for mobile citizens, cooperating mobility providers and society on the whole. The objective is to provide integrated and attractive full-service offers that simplify the access to alternative mobility options, lower entry barriers and create incentives to reduce the personal use of cars or to generally do without owning a car of one's own.

Especially urban areas where the negative effects from high traffic burdens can be observed at present already profit from such a development. At the same time, the opportunity is provided by the networking of thus far isolated mobility offers to develop viable concepts that are oriented on the needs of a society undergoing demographic change. Transport companies and carriers of public transport services benefit equally in the process from a harmonised and networked transport offer in the form of a strengthened market position (new

customers and customer retention), a good measure of freedom of organisation and action, as well as an added reputational value.

With various elements, the Aachener Verkehrsverbund (AVV) – Aachen Transport Association hopes to make a contribution to air pollution control and thus to a sustainable development of the City of Aachen and the region (StädteRegion Aachen). Some elements are still in development or have not yet been implemented completely. This includes a fully operating pedelec rental system. The pedelec rental system run by Velocity is currently (August 2016) not in public operation yet, but the first three stations have already been completed. It will allow citizens and visitors of the city to use an electric vehicle. Due to Aachen's relatively hilly topography, it makes sense having a bike rental system which offers pedelecs.

2.2 Stakeholders

The main objective of this measure is the implementation of a Mobility Alliance in the Aachen region. The following participants are involved:

The AVV (Aachener Verkehrsverbund – Aachen Transport Association) is the measure leader and therefore coordinates all tasks. The AVV supports a business model for the Mobility Alliance through consultants. Furthermore, the AVV has implemented a multimodal traffic connection information system, for which purpose it has itself carried out the tasks relating to timetable data and routing, and contracted three companies for the technical implementation of the complete system.

Department 61 (urban development and traffic facilities) of the City of Aachen Administration is supporting the measure with input for the mobility platform. It also supports Velocity with setting up the pedelec rental stations.

The local carsharing company cambio provides carsharing in the Region of Aachen and sets up carsharing stations. At these stations, hybrid and/or electric cars are available which enable environmentally friendly trips. The municipal utility STAWAG supports cambio by installing charging station for electric cars. Within the scope of the project, cambio additionally continued the development of its infrastructure and software, so that it is multi-card-compatible and customer data can be exchanged within the Mobility Alliance.

Moreover, the AVV, Department 61 of the Aachen City Administration and cambio have developed a multimodal mobility platform as well as a combination of mobility services and tariffs that have been tested by test users in the pilot phase of the Mobility Alliance.

ASEAG is a bus transport company in the city and broader region of Aachen and therefore responsible for the transport of more than 220,000 people per day. As a part of this project, the ASEAG has taken on the market analysis with the support from a market research enterprise.

Working Group 85.2 (mobility, structural development and tourism) of the Administration of Aachen and the broader region (StädteRegion Aachen) supports this project.

The Chair of Transportation of the city's university of applied science (FH Aachen) is supporting the evaluation of the measure.

The Institute of Urban Planning and Transport (ISB) of RWTH Aachen University is working out the evaluation for this measure.



Figure 1: Stakeholders of the Mobility Alliance project

3 Mobility offers

Aachen is the western-most city in Germany with about 250,000 residents (Statistical Almanac 2014). It reports more than 80,000 inbound commuters and more than 30,000 outbound commuters per day (commuter statistics, IT.NRW, 2016). The city is primarily known for its long history and the related cultural, archaeological and architectural heritage. This is one of the reasons for tourism in Aachen. Overall, more than 17 million day-trip visitors and business travellers come to the city of Aachen each year. The hotel industry reports about 1 million overnight stays per year (Aachen tourist service e.V., press release 2016).

23% of the households in Aachen do not have any or secure possibility to park bicycles on the premises of the residence. Another 15% can only reach a parking space with difficulty because, for example, steep stairs leading into the basement. In the broader region of Aachen, these values are lower owing to the scattered construction. 12% do not have a secure bicycle parking space and 11% can reach it only with difficulty. Accordingly, 32% of the households in Aachen do not own a bicycle (28% in the broader region). Likewise 34% of households in Aachen can do without a car of their own, while only 18% of households in the broader region can do so. 53% of people in Aachen have unlimited access to a car on weekdays. In the broader region, this portion is higher by 10%. 30% of people in Aachen cannot use a car, while only 19% in the broader region do not have a car available. 30% of those surveyed in Aachen hold a season ticket for public transport, while this figure is 15% in the broader region. Both in Aachen as well as in the region, the portion of non-transferable season tickets, e.g. semester and job tickets, is four times higher than the portion of transferable season tickets. In the city of Aachen, cars are used by far less frequently than in the broader region (Aachen 51%; region 70% of the travel routes). Consequently, the percentages of the other means of transport are higher in Aachen. It must also be considered, however, that there has not been any change in the percentage of cars in Aachen since 1990 when it was also 51%. Since 1990, the bus and railway percentage saw an increase by 5 percentage points, which however was completely due to a relocation of footpaths. (Mobility key figures taken from the Aachen Mobility Survey 2011, 2012.)

These values indicate substantial potential for shifting car traffic to the other means of transport. Foremost in view of improving air quality, there is a clear need for action by the city and the broader region of Aachen. In the following subsections, the mobility offers that are available to the residents and, e.g. commuters or tourists for their mobility are presented in detail before their networking in the Mobility Alliance is discussed in the further sections 4, 5 and 6.

3.1 Bus and railway offers

The Aachen Transport Association (AVV) includes the city of Aachen, the broader region of Aachen as well as the districts of Düren and Heinsberg. The AVV includes 35 towns and municipalities covering an area of 2,276 km². In this area, the following applies to the use of buses and railways:

- the AVV association tariff applies on all AVV bus lines and without limitation also on all short-distance trains for 2nd class tickets,
- harmonised timetables,
- joint customer information.



Figure 2: Spatial delineation of the AVV

The people's mobility needs do not end at the boundaries of the association. Therefore, the AVV cooperates with other transport associations and enterprises in North Rhine-Westphalia and in the European region of Maas-Rhine. Particular focus rests on the reduction of diverse access barriers in the segment of short-distance transport across the boundaries of associations and the boundaries in North Rhine-Westphalia, neighbouring association and in the three-country region (Belgium, Germany and the Netherlands).

The Aachener Straßenbahn- und Energieversorgungs AG (ASEAG) [Aachen Tram and Energy Supply Company], as a municipal bus transport enterprise, is the most important mobility service provider in Aachen.

Since the start of the project, various measures have been taken by the AVV in order to make the public transport offers attractive. For this purpose, the AVV takes on a coordinating role in consultations and support of municipal transport authorities and the harmonisation between the transport enterprises. In the process, the need is assessed and corresponding adjustments to the offered transport times are developed, harmonised and implemented. This concerns, for example, direct connections, additional rides per day, modification of the routing of lines or inclusion of new residential and commercial areas.

Besides the current timetable adjustments, the following selected measures have been conducted since the project launch, which strengthen the public short-distance transport and thus the backing of the Mobility Alliance:

- In order to alleviate the traffic situation in the city centre of Aachen, a park-and-ride cooperation including a corresponding special rate for rides between selected parking spaces in Aachen and Aachen's city centre has been in place since autumn 2012 already. The cooperation partners for this service are the city of Aachen, APAG, ASEAG and the AVV.
- Campaign days to improve acceptance of the mobile phone ticket have been held in 2013 with discounted ticket prices as an incentive for new customers. The still relatively young electronic sales channel was promoted in campaign and information events.
- At the end of the year 2013 already, the fundamental decision on the introduction of the electronic fare management (EFM) was resolved for the region of the AVV, which means a significant restructuring of sales activities. In 2014, the subsidy registration and in 2015, the subsidy application was submitted to the sponsor, the special purpose association NVR (Nahverkehr Rheinland). It is expected that the first tickets on chip cards, initially season tickets, will be issued in the AVV by the mid-2017.
- The concept of guest tickets was implemented on 01/01/2014, which had been developed in the year before by the AVV, VRS (Verkehrsverbund Rhein-Sieg) and the involved tourism associations. This ticket permits guests, who stay at one of the participating enterprises, to use buses and railway for their arrival and departure, and also during their stay, free of charge in the complete network of the two traffic associations.
- The development of an AVV app was a priority in the further development of the electronic AVV information system in 2014. The "avvconnect" app that was launched in November 2014 offers a departures monitor and a route planner for the public short-distance transport. On daily average in 2015, about 100,000 connection queries were processed.
- Since the beginning of 2015, there is a consistent short-distance tariff between the Aachen Transport Association and the Rhine-Sieg Transport Association under a tariff cooperation for rides by bus and railway.
- As a partner, AVV supports the "Zukunftsnetz Mobilität NRW" [Future Mobility Network North Rhine-Westphalia], which helps its member municipalities launch the municipal mobility management and make it more robust. The network emerged in 2015 from the predecessor network, "Verkehrssicheres NRW" [Traffic Safety North Rhine-Westphalia] and it is sponsored by the Ministry for Construction, Residential Housing, Urban Planning and Traffic of the State North Rhine-Westphalia.

- Additional businesses are continuously being acquired as job ticket customers, not least in view of the clean air plan of the city of Aachen. As a part of this, RWTH Aachen University, the largest employer of the region, also continued the job ticket offer for its employees in 2015, which has been available since 2011. More information about this can be found in the Implementation Status Report of measure A1.3 Sustainable university traffic that will shortly be available from the CIVITAS website.
- In supplementation to the existing, cooperative¹ AVV Job Ticket, the AVV Companies Ticket was developed in 2015/2016, which is based on a voluntary² approach and is expected to be included additionally in the tariff offer in autumn 2016. Under a separate pilot project, the latter can also be obtained even by small enterprises through their membership in a corresponding head organisation, so that the AVV will from now on enable access to discounted transport tickets for professionals in nearly the entire bandwidth of businesses, independent of their size.
- Through the continuation of the contracts, students at the four universities located in the AVV region continue to receive the AVV semester ticket that has been expanded further by the North Rhine-Westphalia semester ticket since 2009. Thus, the state-wide use of all means of transport in public transport is permitted in North Rhine-Westphalia. Corresponding semester ticket contracts have also been concluded since the start of the winter semester 2015 with the two new universities of Aachen, the “ABS Aachen Business School” and the “European University Rhine/Erft, Aachen Campus”.

Year	Activity
2012	Park-and-ride cooperation
2013	Campaign and information events for the mobile phone ticket
	Decision on introduction of the EFM
2014	Introduction of the guest ticket
	Launch of the “avvconnect” app
	Registration for EFM subsidies
2015	RWTH continues job ticket
	Development of the AVV business ticket
	All universities in Aachen continue the semester ticket, new universities introduce it
	AVV/VRS tariff cooperation
	AVV becomes a partner in the “Future Mobility Network of North Rhine-Westphalia”
	Application for EFM subsidies

¹ In the cooperative offer, the job ticket is calculated for all employees of a business.

² This model provides that at a company with 50 employees or more, depending on the number of job tickets bought, a discount of 5% to 10% is granted on the price of a AVV season ticket (by price stages).

Table 1: Selected developments in the bus and railway segment in the city and broader region of Aachen

The manifold measures taken in the AVV illustrate that the needs of diverse groups of users, e.g. employees, students and tourists, are addressed in particular depth. Besides the cooperation for the use of park-and-ride offers, great emphasis is also placed on the combination with other mobility services. These are discussed in more detail in the following subsections.

3.2 Car sharing

The largest provider for station-based car sharing in Aachen is cambio Aachen. The provider has been established in the city in 1990 already making it one of the pioneers in Germany. Each cambio car in Aachen replaces eleven private vehicles. In the year 2015, this was equivalent to 1,200 vacated parking spaces. Currently, 7,000 customers have 144 vehicles available at 50 stations in Aachen and the broader region, 10% of which are electric cars. In the Aachen region, cambio is represented in the cities of Aachen, Eschweiler, Herzogenrath and Jülich. Yet, also the cross-border cooperation with cambio in Belgium makes cambio very attractive for the Aachen region, given its cross-border traffic connections.

The corporate group “cambio Mobilitätsservice GmbH & Co. KG” in Germany and Belgium is currently represented with more than 755 stations in 19 German and 34 Belgian cities. More than 79,000 customers are on the road with more than 2,100 vehicles. In each year since its founding, the corporate group has been awarded the “Blauer Engel” environmental seal.

The combination of public transport and car sharing is by now a fixed part of urban mobility. cambio therefore cooperates with local public transport providers in all cities and grants subscribed customers special conditions. In the city of Aachen and the broader region, a cooperation with ASEAG has been established for 20 years. The holders of ASEAG season tickets benefit from discounted travel costs and a reduced registration fee at cambio.

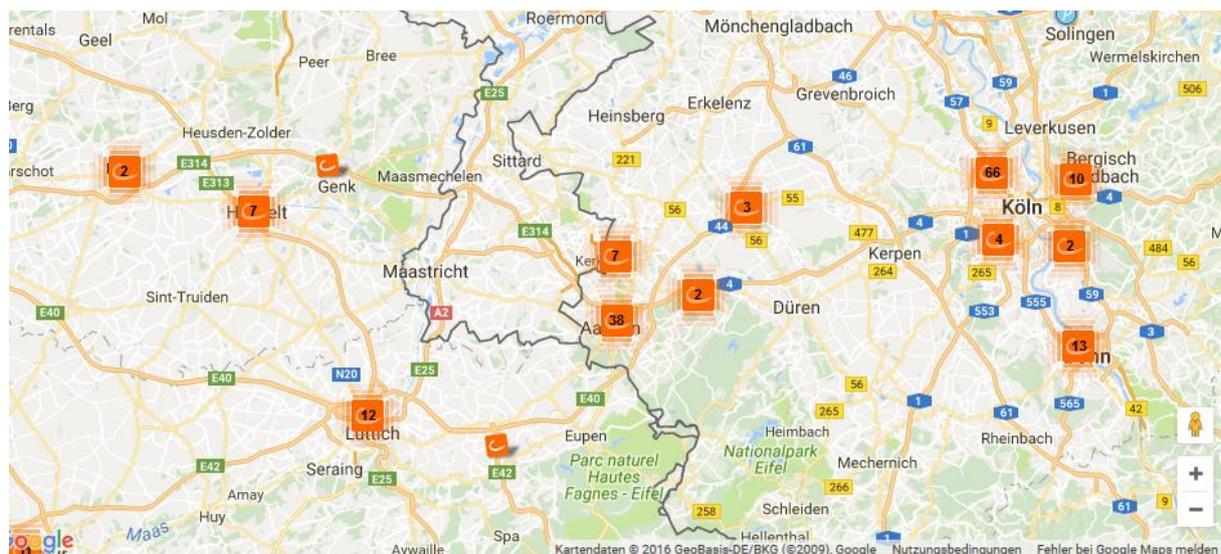


Figure 3: cambio sites

Source: cambio website (retrieved on 27/07/2016)

Furthermore, DB Carsharing with Flinkster operates two stations in Aachen. At the central railway station, there is a station with currently four vehicles (3 small vehicles and 1 station wagon). The second site is not located in the centre of town but between two motorway connections and likewise offers four vehicles (1 small vehicle, 1 compact vehicle and 2 vans). The service is operated by Deutsche Bahn [German Railway company] and facilitates the use of more than 4,000 vehicles Germany-wide in the partner network.

Since the launch of the DYN@MO project, three cambio electric charging stations have been opened in Aachen as a part of measure A1.2 "Electromobile Living". The first two were the stations in Turpin and Rosstraße in April 2014. The third station Philipp-Neri was opened in June 2015. Within the project, cambio was able to familiarise with e-car sharing, adjust the systems and gather experience of how e-vehicles can be integrated in the car sharing system. The collaboration was enhanced by the joint project work involving all actors operating in the area relating to (e-)mobility. More information about this can be found in the Implementation Status Report of measure A1.2 Electromobile Living available from the CIVITAS website.

As a part of the measure A3.1 Mobility Alliance, cambio additionally conducted an update of its entire infrastructure and the car sharing software, to reach the so-called "multi-card reader-compatibility". Previously, the intelligent key safes and board computers in the cambio cars used to be able to read only the chip cards of the car sharing technology manufacturer INVERS. To be able to open and start cambio cars also using chip cards of other mobility providers, e.g. velocity or ASEAG, the following work had to be conducted in detail:

- Hardware and software update of the altogether 11 intelligent key safes
- Hardware and software update of the presently 90 stand-alone board computers
- Software expansion of the cambio car sharing management software for the administration of the new chip card type "Mifare Desfire"
- Software expansion of the cambio car sharing management software for importing card stacks of the new chip card type "Mifare Desfire"
- Procurement of a card reading device for the new chip card type "Mifare Desfire"

Furthermore, cambio is expanding its software to enable the import of customer data from the partners in the Mobility Alliance:

- Transfer of customer data via openID
- Validation system for Mobility Alliance sales partners



Figure 4: Car sharing with electric and conventional vehicles at RWTH Aachen University

Source: Institute of Urban and Transport Planning

3.3 Car pooling

More than 80,000 people commute each day to their workplace in Aachen and more than 30,000 people commute out of the city of Aachen (commuting calculation IT.NRW, 2016). The population of Aachen travels 58% of its commuting distances by car, 95% of whom drive their own car and merely 5% are passengers. Among the residents in the broader region, the car dominates even more strongly: 79% of commuting distances are travelled by car; the distribution of drivers and passengers is the same as in Aachen (Aachen Mobility Survey 2011, 2012). Great potential for carpooling is indicated here. Car pools are a suitable means to relieve the roads and spare the environment while reducing the travel costs per person at the same time.

For this purpose, the city and broader region of Aachen are participating in the car pool portal for commuters, "Pendlerportal" [Commuter Portal] (www.pendlerportal.de), since February 2014 and the two universities, RWTH and FH are participating since 2015. Thus, 28 towns and districts in North Rhine-Westphalia are already subscribers of the internet platform or app that can be used free of charge.

The AVV also supports the Commuter Portal in order to conjoin supplementing mobility offers in the interest of the Mobility Alliance. Foremost in rural regions, regular car pools and occasional car pools can be an important addition to the bus and railway offer. Therefore, also bus and railway connections are displayed on the Commuter Portal besides the carpool offers. This provides an expanded service for the user in the case that no car pool is available. The Commuter Portal is understood as a sensible addition to public short-distance transport and it has cooperated successfully for many years with a number of transport

associations. Together with the Car Pooling Working Group in North Rhine-Westphalia, the Commuter Portal is represented in ten German federal states.

The website www.pendlerportal.de was completely revised in early 2015 and since then offers additional features and improved search options. Moreover, the internet appearance was optimised for the use of smartphones and tablets. There is also an app for smartphones.

The evaluation of the usage statistics of the commuter portal shows for RWTH Aachen that the platform has not yet been well used for trips to work or university. For more information please see the Implementation Status Report of measure A1.3 Sustainable university traffic that will shortly be available from the CIVITAS website.

47 Suchergebnisse

Ihr Einsparpotential: ?

2,34 t p.A.

3116,46 €

Suche weiter eingrenzen:

- Ich möchte mitfahren bei:
- Ich bevorzuge ein:
- Ich habe Gepäck:
- Umweltplakette:
- Kraftstoffart:
- Autogröße:

	Start- / Zielort	Ankunft / Abfahrt Zielort	Wochentage	Fahrzeit
	Von Simmerath Bushof (0km) Nach Aachen Bushof (0km)	Ankunft am Zielort 06:28 Uhr (-13min) Abfahrt vom Zielort 18:20 Uhr (80min)		Details
	Von Simmerath Bushof (0km) Nach Aachen Bushof (0km)	Ankunft am Zielort 06:08 Uhr (-38min) Abfahrt vom Zielort 18:20 Uhr (80min)		Details
	Von Simmerath (2km) Nach Jülicher Straße, Aachen (3km)	Ankunft am Zielort 07:45 Uhr (-15min) Abfahrt vom Zielort 17:00 Uhr (0min)	Mo Di Mi Do Fr	Auto: 35 Min. Details
Folgende Angebote aus dem weiteren Umkreis könnten Sie vielleicht auch interessieren:				
	Von Monschau (9km) Nach Templergraben, Aachen (0km)	Ankunft am Zielort 08:00 Uhr (0min) Abfahrt vom Zielort 16:30 Uhr (-30min)	Mo Di Mi Do Fr	Auto: 46 Min. Details
	Von Eschweiler (22km)	Ankunft am Zielort 08:00 Uhr (0min)	Mo Di Mi Do Fr	Auto: Details

Ihre mögliche Verbindung für die Hinfahrt

 avv	Von Simmerath, Deutschland Nach Simmerath Bushof	06:28 Uhr 06:35 Uhr
 avv	Von Simmerath Bushof Nach Aachen Bushof	06:35 Uhr 07:40 Uhr
<small>BUS</small> <small>Linie: SB63</small>		
 avv	Von Aachen Bushof Nach Aachen, Deutschland	07:40 Uhr 07:47 Uhr

Figure 5: Example of a Commuter Portal result

3.4 Pedelec rental system

Students from the two universities, RWTH and FH Aachen, have founded a student initiative aiming to improve the mobility of both students and all other inhabitants of Aachen by providing a pedelec rental system in the City of Aachen. They are developing this service that is meant to support public transport and increase the share of cycling. The student initiative has since become a limited liability company called “Velocity” managed by two founders of the initiative.

Velocity’s vision is to install a pedelec rental system with approx. 100 stations and 1,000 pedelecs. The project is meant to make electric mobility in Aachen visible and practical. Once completed, the station network will cover the entire inner city with a maximum distance of 300 meters between two stations. The most important locations include the central university institutions, public transport stations, carsharing stations, and public/cultural institutions.

Development in the context of CIVITAS DYN@MO

The administrations of the City and the StädteRegion Aachen and the RWTH university administration support the development of the pedelec rental system considerably by providing the necessary spaces, helping with building applications, and grant approval when required. The Institute of Urban and Transport Planning at RWTH Aachen University has supported this initiative since the start and already conducted a site analysis in 2013 that serves as the basis for the gradual installation of the system. Furthermore, the administration of FH Aachen contributed €20,000 (net) for the installation of a station at the “Bayernallee” location as part of the CIVITAS DYN@MO project. In the last three years the CIVITAS DYN@MO project supported and pushed forward the development of the pedelec rental system and the installation of mobility stations.



Figure 6: Pedelec rental station at the Computer Science Centre at RWTH Aachen University

Pictures: Institute of Urban and Transport Planning (2015)

The developments in recent years and numerous meetings between the City of Aachen, the StädteRegion Aachen, the AVV, the universities, and Velocity have shown that the goal of the former student initiative was very ambitious. The lacking know-how and experience with setting up such a system became apparent during the project development. For these reasons, only three stations were completed by August 2016. Velocity is planning to launch the public operation of the rental system once five stations have been installed.

More information on this system is also included in the Implementation Status Report of measure A1.3 Sustainable university traffic that will shortly be available from the CIVITAS website.

4 Market Research

The local mobility market in the AVV region was analysed in two phases by means of systematic market research. The market research includes quantitative and qualitative methods as well as the analysis of existing market research documents and other data (desk research). The results of the analysis were the base for the development of the potential analysis. The company mobilité consulting was contracted with the market research. Mobilité contracted the company COMPASS consulting with the quantitative and qualitative studies.

4.1 Quantitative results of the survey

To determine the customer potential and the needs of potential customers, the mobility patterns, preferences and attitudes towards the present mobility and the mobility that is desired in the future were assessed in a quantitative survey of nearly 1,500 participants.

The online survey was conducted from December 2013 to January 2014. 1,464 people participated in the survey, 58% of whom were men and 42% women. Two-thirds of them live in the city of Aachen, about 30% in the Aachen region and 6% in Belgium. The majority of those surveyed hold a driver's license (84%), 48% of whom have unrestricted access to a car and 18% have no car available. 61% of those surveyed hold a season ticket for public transport, nearly three-quarters of which are non-transferable season tickets.

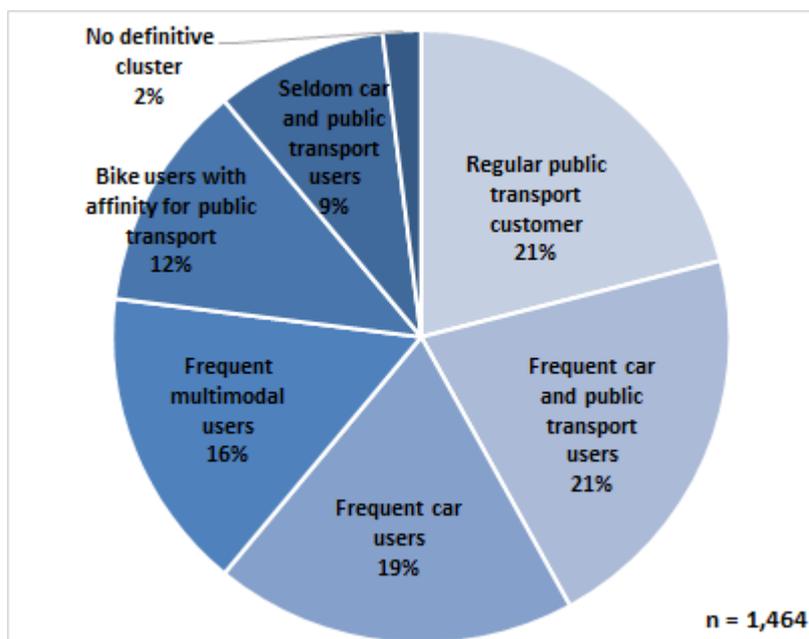


Figure 7: Distribution of user groups in the online survey

As a result, different user group clusters could be empirically identified (see Figure 7). As the target groups for the Mobility Alliance, four user groups were thereupon defined, based on their specific mobility behaviour: “regular public transport customers”, “frequent users of cars and public transport”, “frequent car users” and “frequent multimodal users” (see Figure 8). They are also differentiated by their socio-demographic characteristics (see Figure 9).

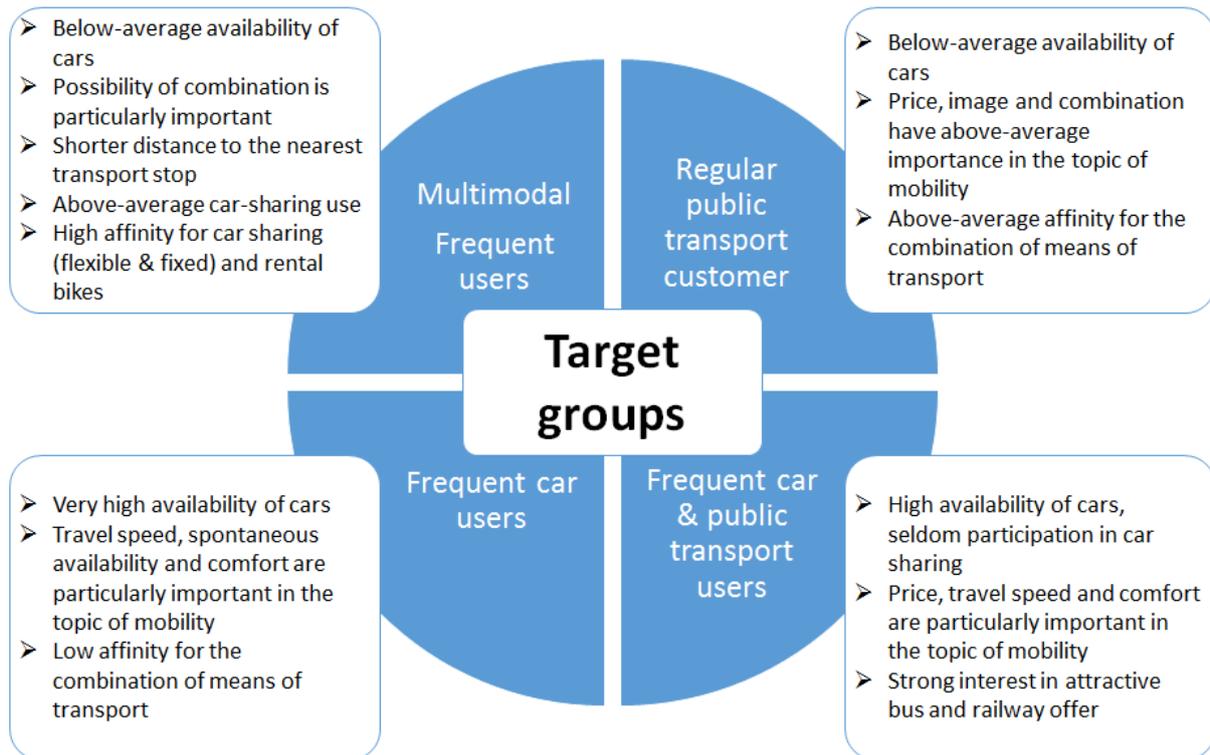


Figure 8: Mobility patterns of the target groups for the Mobility Alliance

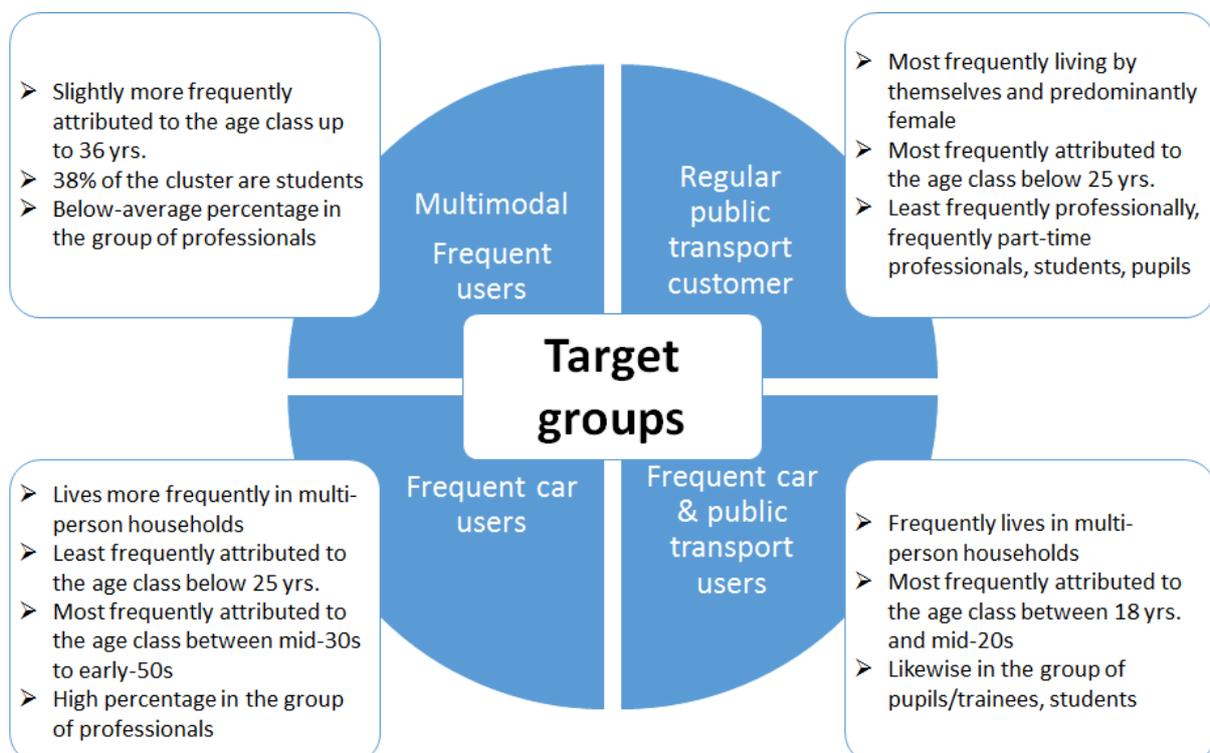


Figure 9: Socio-demographic characteristics of the target groups for the Mobility Alliance

By means of the mobility patterns of the target groups, user need-oriented mobility offers can be developed, which can be promoted according to the personal characteristics of the target groups.

4.2 Qualitative results of the focus group discussions

Subsequently, in January 2014, representatives of the four target groups were invited to seven focus group discussions in the course of a qualitative market survey in order to validate the results of the quantitative market survey. It became apparent in the process that increasing flexibility and customisability in the “offer and tariff structure” is of great importance to those surveyed, whereas the granting of discounts is considered secondary. Particularly relevant for the users is the access to integrated multimodal information. Furthermore, two significant insights could be gained from the market analysis, which permits the conclusion of there being great potential in the identified target group. Firstly, there is a trend towards the selective, needs-oriented shift away from motorized individual transport (e.g. car, motorcycle), provided that an alternative offer (information, booking and access) is available from one source. Secondly, there is a trend toward flexible mobility without a car of one’s own (car substitution) depending on the reason for the trip or the destination.

4.3 Potential analysis

In the next step, the market potential of the Mobility Alliance in the (ideal) condition that has become steady in practice was estimated, based on the insights gained from the market survey and from a local market analysis. The launch of an integrated mobility offer in the scope of the described model of a Mobility Alliance creates diverse benefits for end customers and mobility providers, as well as for public institutions and society. Here, not every area can be evaluated by economic criteria. By establishing a Mobility Alliance, a comprehensive, not (directly) economically quantifiable benefit is created in the following areas among others:

- The improved integration of the transport carriers provides customers with a comprehensive mobility offer that does not require a car of one’s own.
- Shifting of trips to eco friendly transport modes and the related modal shift render numerous positive effects for the traffic, environmental and regional policy in the AVV region. Among them are falling costs in the area of climate change (especially CO₂ emissions), clean air, traffic accidents, noise and traffic congestion, as well as a reduced use of space in the transport sector.
- The image and market positioning of public transport as the backbone of the Mobility Alliance is strengthened. This improves adaptability with regard to the manifold requirements and challenges due to the evolving mobility needs of residents and changing framework conditions.

In addition, an economic benefit can be calculated in the following areas, which can already be partly quantified in monetary terms:

- Especially by acquiring new target groups for the providers in the Mobility Alliance, there is great potential for raising demand to up to 20 million trips more per year in the long run, a large part of which is achieved from the effect of car substitution.

- Comprehensive additional market potentials for the transport companies in the AVV and the further mobility service providers can amount up to EUR 60 million per year under certain framework conditions (integrated, multimodal offers; establishing acceptance of the EFM; car sharing offer being expanded; bike sharing offer being implemented; mobility stations being built). Of these potentials, nearly two-thirds are ascribed to car sharing offers (commercial and private offers) and nearly one-quarter to public short-distance transport.
- There are further long-term income potentials generated by the brokerage of trips and, if applicable, the integration of matching advertising via the mobility platform, the scope of which cannot be assessed yet at this time.

Summing up, it can be noted that the described benefit from the structuring of the Mobility Alliance justifies the costs incurred for this purpose by the AVV. The quantifiable costs in the amount of approx. EUR 1.75 million on the part of the AVV are shown alongside substantial income and demand potentials in the AVV region. In addition, in the scope of an overall economic analysis, the relief for the transport system through the effects from shifting transport away from the car and the positive contribution to public services by providing a broader mobility mix must be evaluated as being positive. Moreover, there is a significant benefit in terms of strengthening environmentally friendly traffic with the related positive ecological effects.

The calculation of potentials is largely based on assumptions, as no Mobility Alliance with a comprehensive business model has been implemented and studied to date, and as corresponding reliable insights are lacking. Therefore, the calculated values of the economic benefit must be understood subject to reservations; merely the proportions can be consulted for later analyses and considerations.

5 Mobility Alliance

5.1 Business model

This section has the objective of analysing, classifying and evaluating organisational, financial, technical and legal aspects within the scope developing a Mobility Alliance business model. It is to describe a potential strategy for the successive implementation (test phase during the project period and a medium-term market implementation) of a Mobility Alliance in the AVV (city of Aachen, broader region of Aachen, districts of Düren and Heinsberg) and the bordering European region of Maas-Rhine. The company *mobilité consulting* was contracted with the business model.

5.1.1 Price system and multimodal product bundles

A central part of the Mobility Alliance business model consists of new tariff products facilitating a flexible use of all offered means of transport by the customers. For this purpose, requirements for a multimodal price system have been discussed and defined. Tariff solutions already existing in the market, like product bundling as well as additive use-oriented tariff approaches without fixed service volume, have been included in the analysis. The present market experiences (e.g. in Hannover and Düsseldorf) have shown that the acceptance of product bundles is low thus far. When many variants are offered, this increases complexity for sales and also for the end customer. In spite of the overall high discounts, the purchase decision likewise frequently depends on the season public transport ticket, which appeals to only individual target groups. This makes the classic product bundling rather an instrument for retaining customers, especially regular public transport customers whose season ticket could be enhanced by multimodal offers but hardly any new customers are acquired thereby.

The approach of the additive tariff is based on a use-dependent pricing by addition of the mobility partners' basic tariff. To reinforce the customers' confidence in prices, there is the option to set price caps for the respective transport offers (e.g. daily cap from X hours of car sharing use or X trips in public short-distance transport per day). The additive tariff offers the possibility of flexible pricing depending on the personal use on the basis of the existing tariff system. Thus, this approach is an instrument for the acquisition of new customers, as it is characterised by low access barriers to the multimodal use.

Furthermore, a multimodal tariff system has been developed, which takes both the customers' as well as the mobility service providers' preferences into account. It represents an integrated, compositional tariff for all means of transport with a standardised tariff logic and user-dependent ex-post discounting. Since it is characterised by low entry barriers to the multimodal use, it offers opportunities for acquiring new customers and retaining existing customers.

Product and price bundle			Additive tariff	Multimodal tariff																
Public Transport	City-XL season ticket	35 €	Per Ride AVV single ticket = 2,65 € (price cat. 1) Car sharing = 2,50 €/h & 0,30 €/km Bike sharing = 1,50 € / 30 minutes Invoice for one month (20 rides) 10 x Public transport ticket = 26,50 € + 5 x Car sharing (10 h & 150 km) = 70,00 € + 5 x Bike sharing (5 h) = 15,00 € = Total 111,50 € Ex post-billing with capping, example: 4 bus rides in one day (4 x 2,65 € = 10,60 €) with capping 8,90 € instead → 1,70 € discount	Per Ride <table border="1"> <thead> <tr> <th></th> <th>Basic fee</th> <th>Distance</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>Public transport</td> <td>1,50 €</td> <td>0,20 €/km</td> <td>-</td> </tr> <tr> <td>Car sharing</td> <td>-</td> <td>0,30 €/km</td> <td>2,50 €/h</td> </tr> <tr> <td>Bike sharing</td> <td>-</td> <td>-</td> <td>3,00 €/h</td> </tr> </tbody> </table> Invoice for one month (20 rides) 10 x Public transport: basic fee & 30 km = 21,00 € + 8 x Car sharing (12 h & 160 km) = 78 € + 6 x Bike sharing (3,5 h) = 10,50 € = Total 109,50 € Ex post-discounting, example: 10 € discount on next month's invoice if this month's invoice amount is higher than 100 €		Basic fee	Distance	Time	Public transport	1,50 €	0,20 €/km	-	Car sharing	-	0,30 €/km	2,50 €/h	Bike sharing	-	-	3,00 €/h
	Basic fee	Distance			Time															
Public transport	1,50 €	0,20 €/km			-															
Car sharing	-	0,30 €/km			2,50 €/h															
Bike sharing	-	-	3,00 €/h																	
Car sharing	Basic fee incl. 5 h & 50 km	20 €																		
Bike sharing	120 minutes	10 €																		
Bundle price/month		65 €																		

Figure 10: Examples for different tariffs

For these considerations, the creation of a multimodal tariff with a standardised logic is recommended for the long term (time horizon of 10 years). Based on the conditions required for this purpose (foremost EFM in public transport), also the additive tariff, which initially builds upon the existing rate systems, can be introduced in the medium term as an intermediary step.

5.1.2 Organisational model and technical platform

The implementation of a Mobility Alliance depends to a large extent on the cooperation between different mobility service providers, which additionally continue to act independently in the market. Consequently, the involved actors pose high requirements for the organisational structure of the Mobility Alliance.

Against this background, initially the key processes were defined in a customer and provider perspective in order to determine an optimal structural and procedural organisation. Subsequently, the defined key processes have been transferred into a "Responsibilities/Competencies Matrix (IBZED Matrix)", which breaks down information rights and requirements, consulting, agreement, decision or implementation as to which service provider(s) may be responsible for which key process(s) in the long term.

Furthermore, the requirements for a technical platform that represents the core offer of the Mobility Alliance were determined. In this regard, the interaction of customer, timetable, booking and utilisation data were analysed and visualised with the different background systems of the service providers.

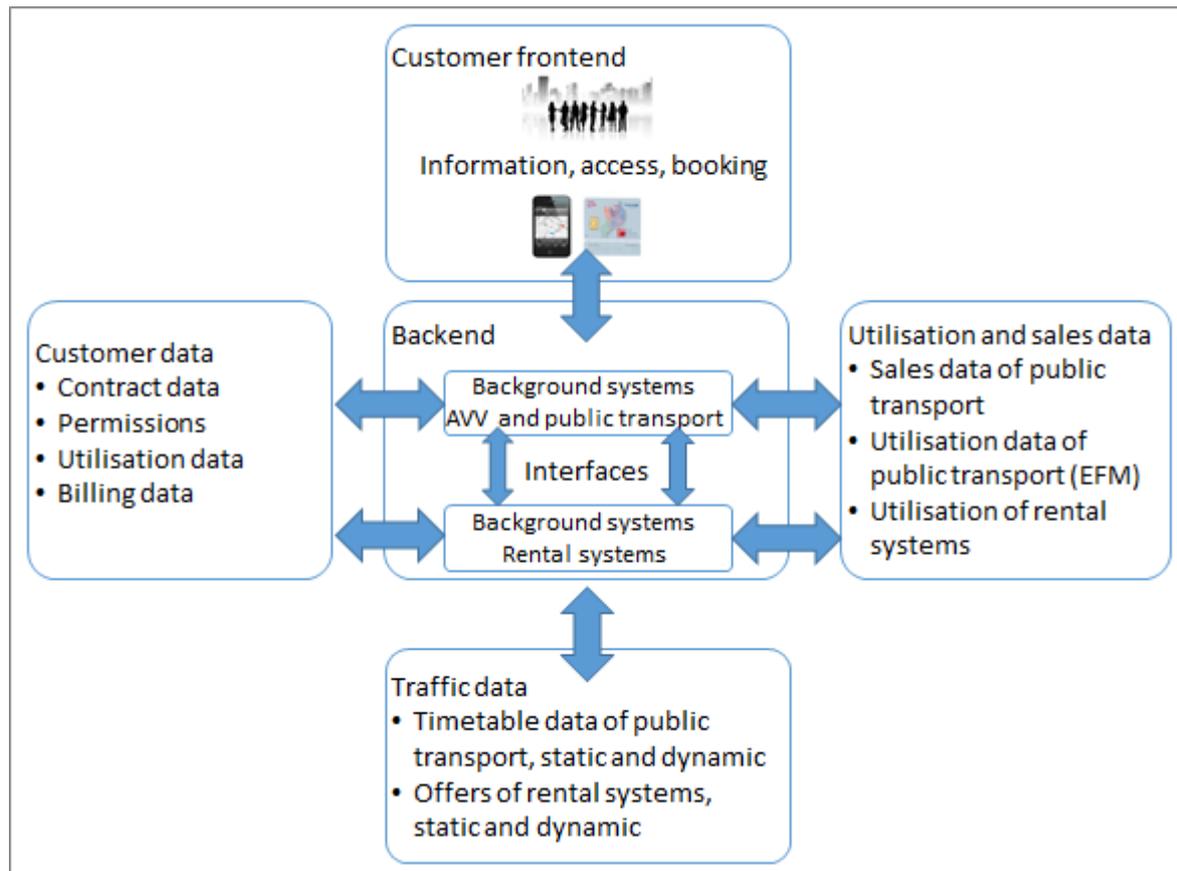


Figure 11: Technical overall infrastructure, frontend, backend and data

5.1.3 Roles and financing model

Based on the results from the breakdown of responsibilities and competencies, a potential roles model was developed, which bundles the individual tasks in the Mobility Alliance into sensible units within a three-level model. The opportunities and risks of implementing the Mobility Alliance were additionally analysed in a legal perspective.

Finally, the medium-term financing need for the DYN@MO pilot phase and the further implementing steps until 2020 were estimated. These costs were compared to the expected benefits of the Mobility Alliance implementation that are created for mobile citizens, mobility providers and society on the whole.

The central access to mobility services within the AVV region is significantly simplified through the integration of all relevant information and via a mobility platform in the form of an app and/or an online portal. Firstly, the reduction of resistances to the use and access restrictions generate increasing incentives for limiting or discontinuing the use of one's personal car. Secondly, those who do not have a car are given a higher measure of flexibility and mobility options that can be financed through the networking of mobility and creation of a quantitatively and qualitatively improved mobility offer.

The potential reduction of car use due to selective shifts of transport for particular trips and/or eliminating the first or second car in consequence of shifting trips to the Mobility Alliance

(modal shift) takes a positive effect on traffic, environmental and regional policy. Among the positive effects are falling costs in the area of climate change, clean air, traffic safety, noise and traffic congestion, as well as a reduced use of space.

On the one hand, urban areas where the negative effects from high traffic burdens, e.g. in the form of environmental damages or increasing congestion can be seen today already, profit from the implementation of a Mobility Alliance. On the other hand, an intelligent mobility networking offers the opportunity, based on thus far isolated mobility offers, to develop viable concepts that are oriented more closely on the needs of a society undergoing demographic change.

Transport companies and carriers of public transport services benefit equally from a harmonised and networked transport offer in the form of a strengthened market position, a strong measure of freedom for organisation and action, as well as an added reputational value. Potentials for raising demand, particularly by acquiring new target groups whilst also through customer retention are presented for providers in the Mobility Alliance. For the transport companies within the AVV and the other mobility providers, this results in additional market potentials, which however depend very strongly on the future framework conditions.

The proactive devising of the regional transport offer of the mobility association continues to be assumed primarily by local or regional actors (in the sense of a “service to the public”) without the influence of transport or service providers acting cross-regionally.

5.2 Mobility Platform

On a multimodal internet platform, inter and multimodal mobility offers as well as supplementing traffic information are to be presented in a bundled form to thereby simplify the choice of the means of transport.

Besides the use of elements for the mobility chip card management for the organisation of the Mobility Alliance during the pilot phase (cf. Section 5.3), innovative “mobility profiles” are to align the search for connections more intuitively along the customers’ needs as part of an information platform, in order to make customary traffic stop-oriented connection queries secondary.

5.2.1 Website with mobility features

A web application has been developed that is publicly available at www.avvmulticonnect.de. The two companies of Aachen, regioIT (technical implementation) and Social Media (design) were contracted for the implementation. The web application follows the principle of “mobile first”. A “responsive design” was chosen, which is primarily geared toward the use of current smartphones. The application, meanwhile, can also be used on a desktop PC.

The user can expect a vast range of networked mobility offers with door-to-door route details, clear map displays and integrated information about bus and railway, car sharing, bike sharing, foot and bike paths, and personal mobility by car. This way, the user no longer merely receives the actual details about bus and railway in the connection information, but

can choose from different offers the one that best matches the user's personal mobility requirements.



Figure 12: Mobility platform in the responsive design

Mobility profiles

Innovative mobility profiles make the search for connections more intuitive for the user. General, indirect “imprecise” definitions of destinations such as “ride to the airport” simplify the mobility search and let direct, classic “precise” queries for connections that are oriented on traffic stops become secondary. Furthermore, the information is expanded for multi and intermodal results, and it is linked to additional relevant sources of information depending on availability. In the user's perspective, a short, consistently repeating sequence of steps is to make the mobility search profiles intuitive in use. The profiles are presented below.

Standard profile:

- “Connection query”: facilitates complete inter and multimodal information on traffic connections. All available mobility options can be displayed and hidden. In Section 5.2.2, this feature is explained in depth. The profile additionally has a clear map display, which is described in more detail below.

Other mobility profiles:

- “Trip to long-distance transport”: The search and choice of the suitable airport or long-distance coach shuttle is to be simplified for flights of nearby airports and long-distance coach connections. The user can plan his trip to a nearby airport or long-distance coach stop by means of an integrated search for flights and long-distance coaches as well as the information on traffic connections. The multimodal connections search is parameterised optimally for this purpose with the flight or long-distance coach timetable data. For this purpose, web interfaces to the relevant airports and long-distance coach carriers have been integrated.
- “Parking in Aachen”: Here, the user searches a map or list for a suitable parking garage and queries his route for the trip by car for this purpose. To do so, the multimodal search for connections is parameterised with the location data of the parking garage.

- “More mobility information”: In an additional profile, various details of further mobility offers, e.g. euregio-tickets and car pools are prepared and linked. The routing-based information of profiles 1 to 3 is not in the focus here.

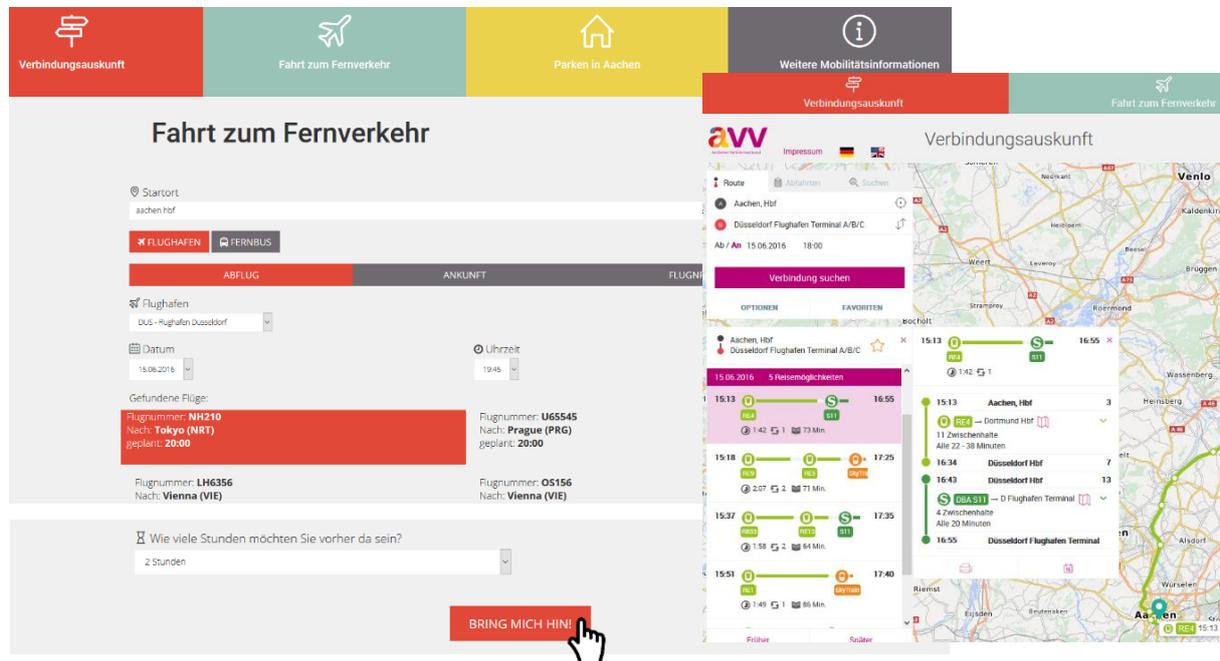


Figure 13: Mobility profile “Trip to long-distance transport”

Integration of information in the map display of the standard profile

Besides the multimodal search for connections in the standard profile, also a clear map is offered. It firstly serves for the selection of the points of departure and arrival, and the visualisation of the connection. Secondly, it offers the option of graphically displaying a number of details on a map. The user can display and hide the following information on the map:

- Public transport stops
- Public transport line network
- cambio stations
- Velocity stations
- Construction site information
- Residential parking zones
- Environmental zone
- Parking garages
- Park+ride spaces
- Pre-sales offices for bus and railway tickets
- Sites to see

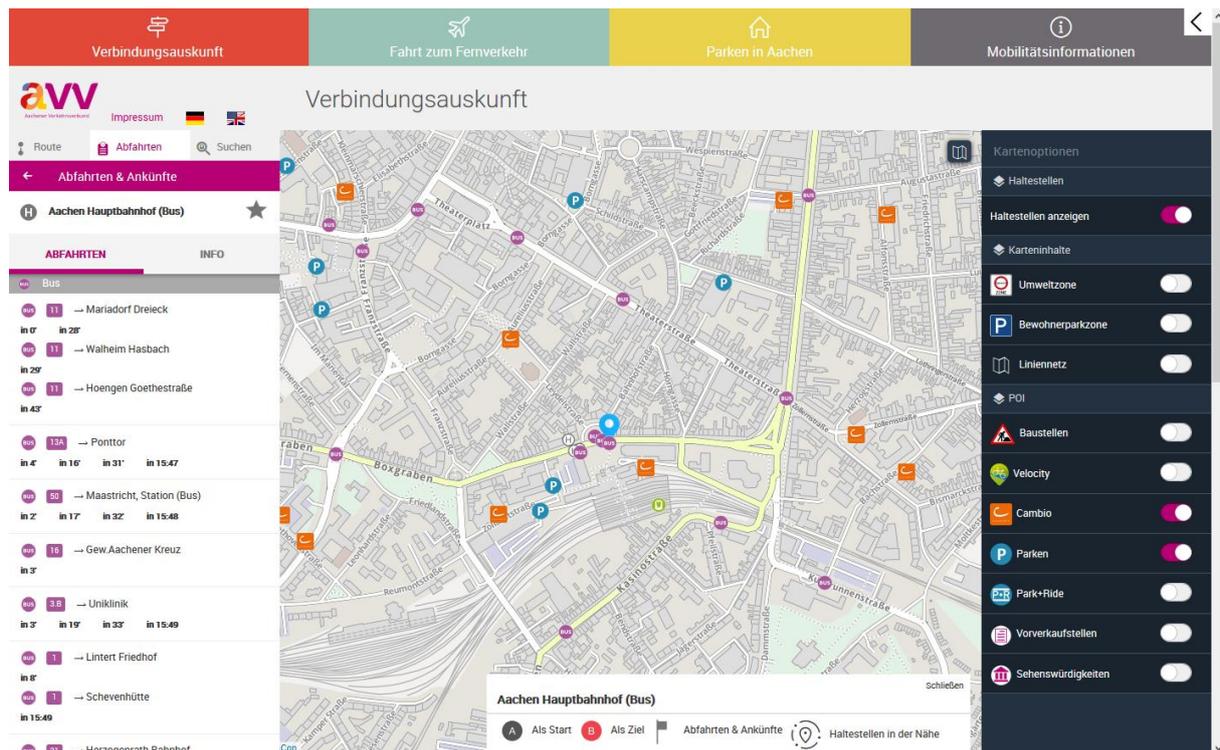


Figure 14: Map display on the mobility platform

Further points of interest can be added depending on relevance. The data of the public transport stops and the public transport line network result from the timetable data (also see Section 5.2.2). The information from the construction site system of the city of Aachen and the information about cambio stations is transferred via interfaces to the system (also see Section 5.2.2), so that the information can then be shown in the displayed map sections.

5.2.2 Multimodal connection information

For the personal mobility requirements, the mobility platform offers multimodal connection information with different means of transport and map displays for stops and the line network, cambio stations, construction site information, parking garages, sites to see and more.

The company HaCon was contracted with the technical implementation of the multimodal connection information. When the application is harmonised with the requirements of the AVV and enhanced, its HAFAS timetable information system will also offer the opportunity to display foot, bike, car and car sharing routes besides bus and railway connections, as well as the combination of various means of transport. Moreover, it will offer the possibility in the future to get information on additional information within the scope of the Mobility Alliance through further interfaces, e.g. taxi, carpooling and long-distance coach information.

In detail, the system offers the following possibilities to the users:

- Search: addresses precise to house numbers, public transport stops, cambio stations, points of interest (POI) (all including auto-complete) and selection via the map

- Public transport connection information with numerous search options (“via” stop, means of transport, direct connections, transfer time, number of transfers, walking speed)
- Public transport departures by stops and lines and in minutes
- Multimodal connection information (public transport, car, bicycle, on foot, car sharing, park and ride, bike and ride)
- Creation of favourites and selection from the history
- Target and actual data and real-time routing (alternatives)
- Informative, clear map displays with real graph of the selected connection, public transport stops and line network, cambio and Velocity stations and additional information (also see Section 5.2.1)
- Tariff schedule and booking link to Handyticket Germany (public transport), cambio (in progress) and Velocity (in progress)
- Print option and calendar export
- Retrieval of the connection query from external pages, e.g. with pre-filled destination

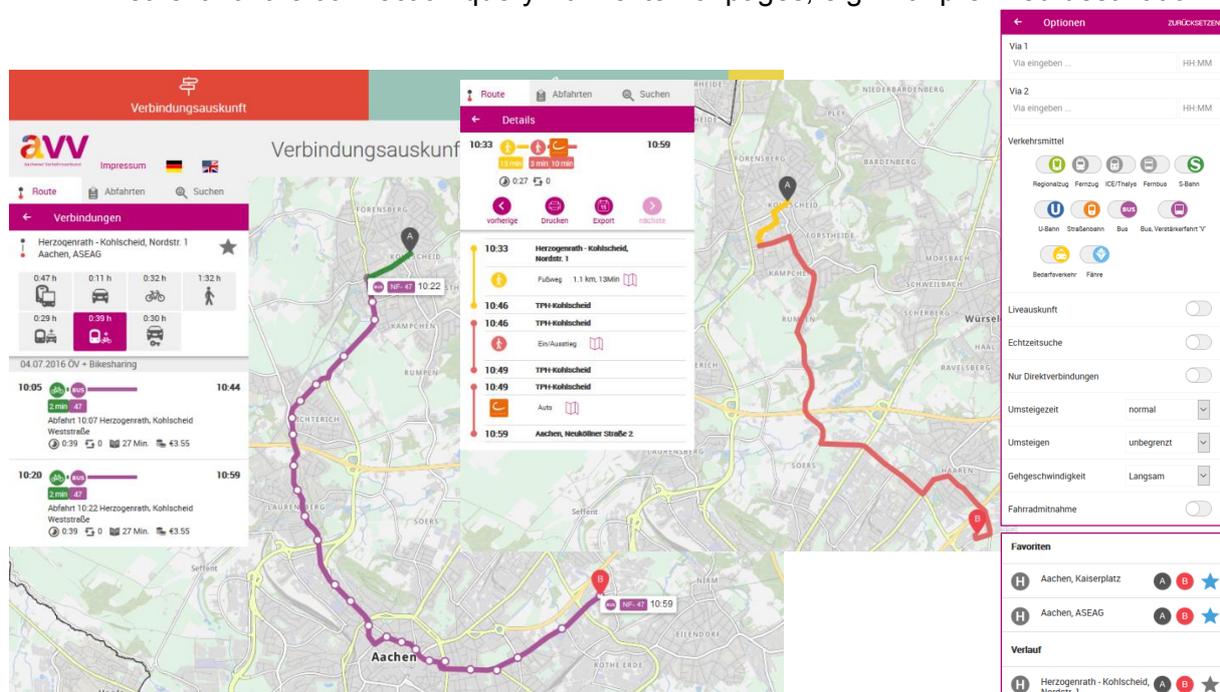


Figure 15: Multimodal connection information with numerous options

In order to provide information and options, the following work for the multimodal information has been completed in detail.

- Calculation of the information by means of the calculation algorithm of the HAFAS server
- Auto-complete in the departure and destination input for transport stops, addresses and POI, incl. the feature for finding a preferred result, e.g. the Aachen railway station
- Conversion of the timetable target data conversion, which is provided by the AVV from the IVU data management tool (for details, see below)
- Real-time data processing of the public transport routing, incl. interface with integration of real-time data (cf. Implementation Status Report of measure A3.2 Travel assistance – individualised notification system available from the CIVITAS website)

- Mapping and information of the public transport ticket tariffs
- Web interface in the AVV design with connection overview, details, interactive open street map (OSM), map layer, departure board, line route, etc.
- Expansion of the HAFAS web interface in responsive web design, so that the website can be displayed automatically on desktop PCs and mobile devices
- AVV delivers the address and POI data covering North Rhine-Westphalia, whereby a resolution down to the specific house number is enabled.
- Door-to-door on-foot routing based on OSM, which facilitates on-foot routing as a complete route or before and after the public transport. This is done by means of the IVU routing module of the company IVU.
- Expansion for the bike-and-ride routing based on OSM, which facilitates routing by bike as a complete route or before and after the public transport. This is done by means of the IVU routing module of the company IVU.
- Expansion for the kiss-and-ride routing based on OSM, which facilitates routing by car as a complete route or before and after the public transport. This is done by means of the IVU routing module of the company IVU.
- The HAFAS proxy server additionally integrates the individual interfaces of the mobility partners cambio and Velocity (in progress). Station data, availability data, price information, product information and source URLs can be called up and processed further with HAFAS (in the map display or the route information)

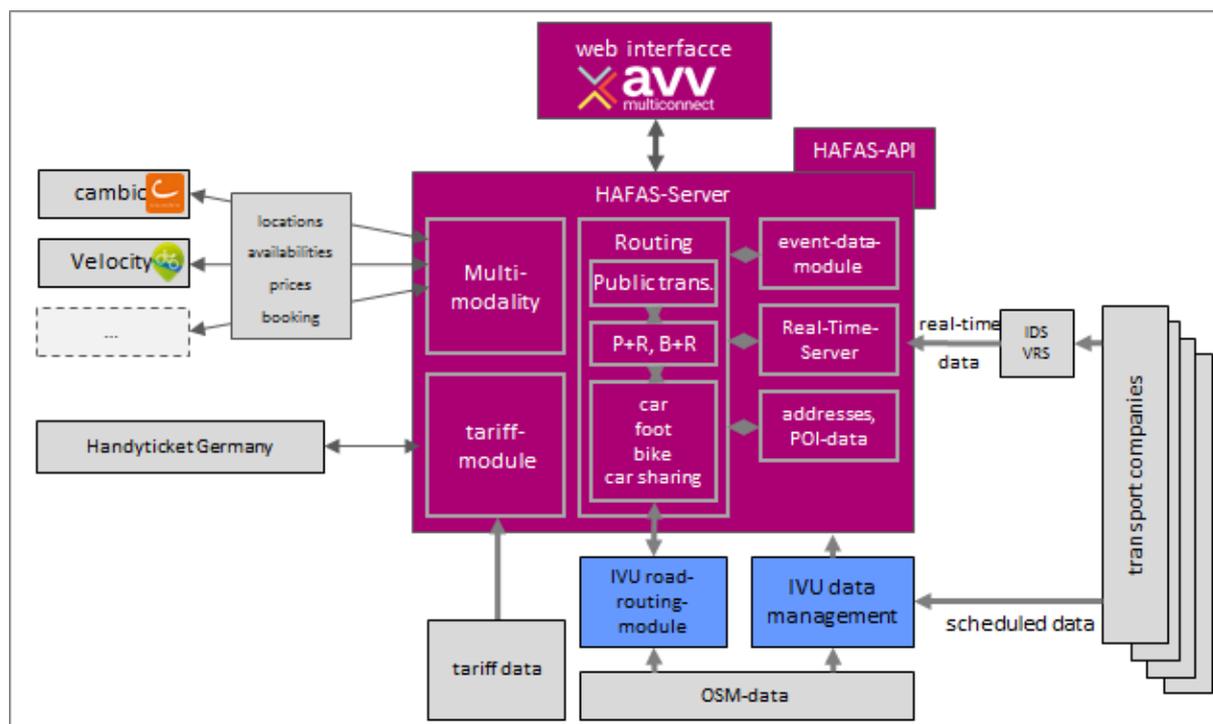


Figure 16: Architecture of the routing information system

The data migration by the AVV for the multimodal connection information system was completed in November 2015. The AVV has been intensely testing the information on a test platform since November 2015 and is continuously expanding and refining the database at the same time. This way, the possibilities of the new system can be utilised increasingly

better. At the same time, also the IVU.pool data management system is applied, which has been used at the AVV since 2000 and has been expanded appropriately by further modules. Two AVV staff members took part in on-site training for the expanded features of the full version of IVU.pool from 3rd until 5th of November 2015. In addition to that these two and a third AVV staff member took part in telephone training on 22.03.2016. The AVV documents this work for the internal use in an internal manual. Since March 2016, the connection information system is in productive operation. It was made public at the start of the pilot phase in April 2016.

The AVV consulted with the system manufacturers HaCon and IVU in the run-up and in the current operation, and has drawn on their support. The AVV is continuously testing the results of the information system and makes entries in the online case processing systems of the manufacturers whenever implausible results occur (currently 84 entries at HaCon and 9 at IVU).

Furthermore, the AVV is conducting the following work for the multimodal information:

- Deepening of the use of IVU.pool
- Familiarisation with and use of the expanded features of the full version of IVU.pool, and internal training of two more colleagues. The following, expanded features were used in the process
 - Timetable editor by means of which trips can be corrected manually
 - Stops module with manifold search and filter options
 - Attributes management (footnotes that must be attributed). Apart from that, the AVV stops were also attributed to tariff zones.
 - Creation of transfer structures with graphics editor
 - Definition of transfer times
 - Creation of through-service (“line changer”)
- Editing of timetable data:
 - Importing of the timetable data from 18 suppliers (that deliver datasets, e.g. other transport associations) with data from 136 enterprises (transport companies)
 - Raw data processing of timetable data using TRANSFORM
 - AVV transport companies
 - Deutsche Bahn
 - North Rhine-Westphalian transport associations
 - Lower-Saxony railways
 - TEC
 - Veolia Limburg

This data is imported and processed into a homogeneous data stock (standardisation of numbers, stops, means of transport, ignoring of duplicate lines, etc.) in the course of which also smaller manual corrections are made.
 - Adoption of a total of 71,812 stops with 327,226 subordinated departure positions of the enterprises. This was done, to the furthest possible extent, based on the stops register of North Rhine-Westphalia. Missing stops and such having been newly added in the course of the test period have been set up. Numerous plausibility checks have been conducted, e.g. check of coordinates for municipalities, comparison of municipal names and the stops

- names (via GIS), as well as the linear distance speed of the trips in the system (done in HAFAS in the raw data processing).
- Import of 11,822 lines and 1,320,336 trips
- Creation of 192 transfer structures, more are in processing
- Creation of 1,191 footpaths and equivalences between/from stops
- Addition of missing coordinates of stops. These coordinates are necessarily required by HAFAS for the provision of information, in order to also identify multimodal information and not just information relating to stops.
- Continuous analysis of the logs in the data processing. The logs are generated automatically during the import, export and processing ("Transform"). In case of discrepancies, the data is checked and refined. By means of the elaborate checks, foremost stops that have been delivered with contradictory information from the different suppliers were noticed. These were passed on to the respective data suppliers and cleared/clarified by them.
- Standardisation of stops names [(municipality), [if applicable, town district] [stop)], max. 50 characters
- Import and in part, weekly or monthly updates of datasets for the timetable plan data or the stops inventory
- Creating, refining and updating the GIS layer for the real graph
- Delivery of 841 POI for information that has been adopted in part from existing data stocks or that has been newly created.

To keep the system operational first of all the system manufacturers HaCon and IVU has to be contracted further on. In addition to that the following work has to be undertaken continuously:

- AVV has to update address and POI data.
- The transport companies in the AVV, Deutsche Bahn, North Rhine-Westphalian transport associations, Lower-Saxony railways, TEC, Veolia Limburg and in the future Arriva has to deliver their time table and station/stops data (after changes) and real-time data (continuously).
- AVV has to edit this data as describes above.
- AVV staff members has to take part in additional training whenever updates of the systems makes that necessary.
- Data and interfaces of the mobility service providers, in this case cambio and Velocity, have to be kept up to date regularly.
- The AVV has to test the results of the information system and make entries in the online case processing systems of the manufacturers whenever implausible results occur.

The screenshot shows the 'IVU HAFAS-Import [POOLTEST@IVU]' application window. It features a 'Datei' menu and a 'Hilfe' button. The main area is divided into several sections:

- Lieferant:** A dropdown menu showing 'DB EFZ (IBNR)' and a 'Rücksetzen' button.
- Format:** Radio buttons for 'Zeichensatz' (ANSI, ASCII) and 'Fahrnummern:' (5-stellig, 6-stellig, 8-stellig). A 'Rücksetzen' button is also present.
- Dateien:** A table with columns for file name and path. Files include 'Bahnhof', 'Bfkoord', 'Fplan / Alldat', 'Eckdaten', 'Btfeld', 'Zugart', 'Metabhf', 'Umsteigb', 'Attributs- und Umsteigedateien', and 'Sonstige Dateien'.
- Haltestellen:** Checkboxes for 'Koordinaten', 'Äquivalenzen', 'Fußwege', and 'Aliasnamen'. A dropdown for 'Quellkoordinatensystem' is set to 'Länge/Breite WGS84'.
- Fahrplan:** Checkboxes for 'L-Zeilen ignorieren', 'Dialog', 'Für Fahrten ohne Linienzuordnung', 'Gattung autom. als Linienname übernehmen', 'Standardrichtung für fehlende *R-Zeilen', 'ungerade Zugnummern', 'gerade Zugnummern', 'Weitere Einstellungen', 'Grenzhalte', 'Kurswagen', and 'Leerversionen anlegen'.
- Attribute:** A dropdown for 'Medium' set to 'STANDARD' and a checkbox for 'Eigenschaften für vorhandene Attribute übernehmen'.
- Dateien mit nicht importierten Fahrplandaten:** A dropdown for 'Ausschlussdateien' set to 'nicht erzeugen'.
- Zustand:** A checkbox for 'keine Importstatistiken generieren'.

At the bottom right, there are buttons for 'Importieren', 'Abbrechen', and 'Beenden'. The status bar at the bottom left shows 'Bereit'.

Figure 17: Import of the HAFAS files into IVU.pool

5.3 Pilot phase of the Mobility Alliance

100 test users tested the Mobility Alliance during a three months pilot period from April to July 2016. The Mobility Alliance in the pilot phase is using a combination of the following mobility measures: On the one hand, a facilitated access to the means of transport, on the other hand, an internet-based, multimodal information and routing platform is being offered in order to facilitate the access to information. Thus, the users can adapt the trip planning to their individual mobility needs.

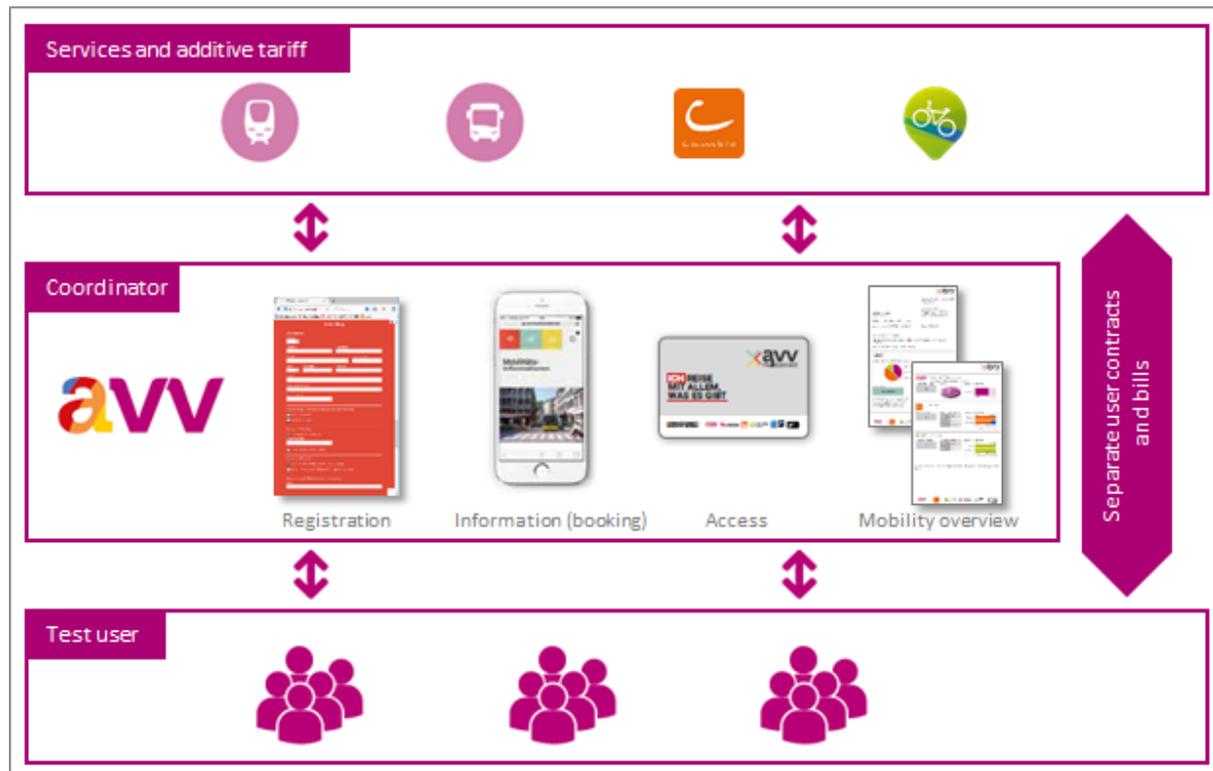


Figure 18: Structure of the Mobility Alliance within the scope of the pilot phase

Test users for the test phase

For the pilot phase in the development of a Mobility Alliance, overall about 100 test users were recruited in the spring of 2016. The test users were recruited through different channels. On the one hand, a request was triggered via the Facebook and website of the Aachen Transport Association on 16 March 2016, which was shared by cambio, Velocity and the city of Aachen among others. On the other hand, RWTH created their own contributions about this on Facebook and Twitter, and the FH Aachen and the city of Aachen on their websites. Furthermore, the former test users from an earlier survey in the autumn of 2014 among the employees and students of RWTH were contacted by email, as they had previously granted their agreement that they would like to receive mail for such purposes.

Overall, 108 people responded to the call from the AVV and registered for the test phase on the newly designed website. Interested applicants, who could not be considered due to the large number of registrations, could sign up on a waiting list. People were then defined as test users, who had registered on the website and who hold an AVV season ticket, and/or who are/will be customers of Handyticket Germany, and furthermore who are/will be customers of the cooperation partners cambio and Velocity. 68 people met these requirements. 25 test users have already been cambio customers before the test phase. 43 test users concluded a new customer contract with cambio for this purpose. Some test users registered with Handyticket Germany specifically for the participation in the test phase. All test users concluded a Velocity customer service, as this was newly offered in the course of the test phase and was not publicly available previously.

All test users received a voucher in the value of EUR 15 (for Mayer's bookshop) as an incentive. In order to evaluate the Mobility Alliance in the test phase, the test users were invited to participate in a survey during the pilot phase (see Section 6.3). The participation in the survey was voluntary. The test users³ participating in the survey received a voucher in the value of EUR 30 as an incentive instead of the voucher in the value of EUR 15.

In cooperation with the project partners offering public transportation, car sharing and bike sharing one single online blank form was developed for the registration with different mobility providers and one integrated chip card was designed and handed out to the test users to facilitate the access to car sharing and bike sharing. To coordinate and manage the communication with and the contracts of the test users, an online admin area was set up.

Mobility offers

The creation of a facilitated access to the diverse mobility offers is crucial for the success of the approach. Therefore, the users were only obliged to register once for all partners of the Mobility Alliance and only one chip card was required for car sharing and bike sharing. The data recorded on the online registration form was adopted by an automated procedure in the corresponding cambio and Velocity contracts. These could be printed out and signed directly by the customer.

The tariff structure of the Mobility Alliance was additive and depended on the individual use of the provided transportation. The services utilised were billed by the individual service providers. To offer the users an overview of the services utilised, the AVV created a monthly overview for each user about his mobility costs and utilisation.

Within the scope of the pilot phase, the test users had three mobility offers available. In the public short-distance transport segment, the test users could either use their season ticket (e.g. monthly ticket, job ticket, semester ticket) as usual or they could use a mobile phone ticket. For the use of the mobile phone ticket, the test users had to register with Handyticket Germany and install the smartphone app if they had not yet used this offer previously. A 10% discount was granted specifically on single-ride AVV tickets as mobile phone tickets and a daily price cap was configured. By means of the daily price cap, maximally the price for a daily ticket – regardless of how many trips are taken – is calculated, as soon as the costs of the purchased individual tickets exceed the price of a daily ticket within one price bracket. As a thank you for the participation in the pilot phase, all AVV season ticket holders received a euregio-ticket in the value of EUR 18.50, because the discounted single-ride tickets are not relevant to them.

In the car-sharing segment, the test users could use the campus rate with a 10% discount on the costs by time and kilometres without registration and without basic fee to test the diverse

³ Those who were interested and registered, but who had not picked up the shared chip card for cambio and Velocity and had not signed the corresponding customer contracts, nonetheless received the opportunity to participate in the survey, so that the reasons for this and other attributes could be recorded. They received a voucher for EUR 15 for the participation in the survey.

advantages of the sharing offer. Merely a driver's license was the condition for using this offer.

The test users for the pedelec-sharing offer could choose from two tariff offers on registration. They could either select a tariff by minutes, where EUR 1.20 is charged for each started half-hour (20% discount), or they could book a monthly subscription for EUR 5.00 where the first 30 minutes of each ride are inclusive (23% discount). Registration was free for this mobility offer, too.



Figure 19: A connecting mobility hub of the Mobility Alliance and the chip card within the scope of the pilot phase

Mobility platform “AVVmulticonnect”

In addition, a website for a multimodal information and routing platform was set up (cf. Chapter 5.2). This mobility platform contains various technological advantages such as door-to-door multimodal routing information (cf. Chapter 5.2.2); malfunction information, real-time data and in case of delays alternative routing for public transport (cf. Implementation Status Report of measure A3.2 Travel assistance – individualised notification system); and flight, long distance bus transport and car park search including integrated multimodal routing (cf. Chapter 5.2.1). Besides, the opportunity is given to social media-oriented test users to profit from user-generated content by interacting with other test users via Twitter (cf. Implementation Status Report of measure A3.2 Travel assistance – individualised notification system).

5.4 Dissemination

Different activities were conducted to bring the Mobility Alliance and the mobility platform to the public's attention:

Date	Activity
11/01/2014	Opinion poll on the the travel patterns of citizens using press release, Twitter and Facebook messages, update homepage, articles in both newspapers (20.000 copies) and article in an advertising weekly (100.000 copies)
13/01/2014	“The Future of Mobility” – search for participants of a group discussion using press release, Twitter and Facebook messages and update homepage

16/03/2016	Message on the AVV Facebook page about the search for test users
	Article on the AVV website about the search for test users
	Message on the Aachen-clever-mobile Facebook page about the search for test users
	Article on the city of Aachen website about the search for test users
21/03/2016	Message on the city of Aachen Facebook page about the search for test users
	Message on the Velocity Facebook page about the search for test users
29/03/2016	Article on the FH website about the search for test users
30/03/2016	Message on the RWTH Facebook page about the search for test users
	Message by RWTH tweet about the search for test users
13/04/2016	Launch of the mobility platform incl. related email to all registered prospects and test users
14/04/2016	Message on the AVV Facebook page about the mobility platform
	Message on the Aachen-clever-mobile Facebook page about the mobility platform
	Message on the cambio Facebook page about the mobility platform
11/05/2016	Message on the AVV Facebook page about the Mobility Alliance and platform
	Message on the AVV Facebook page about the Mobility Alliance and platform
23/06/2016	Message on the AVV Facebook page about switching from the regular AVV public transport information system to the multimodal information system during a server migration
30/06/2016	AVV press release about the Mobility Alliance and platform
06/09/2016	AVV presented the multimodal route planner at a Mobil.pro.fit. workshop in Baesweiler
29/09/2016	AVV presented the measure during the Civitas Forum in Gdynia
25/10/2016	AVV presented the measure during the final conference for the projects Civitas DYN@MO, Civitas 2Move2 and emove in Aachen
November 2016	AVV release of leaflet describing the multimodal routing platform (including travel assistant information in combination with A3.2)

Table 2: Dissemination activities in relation to the Mobility Alliance

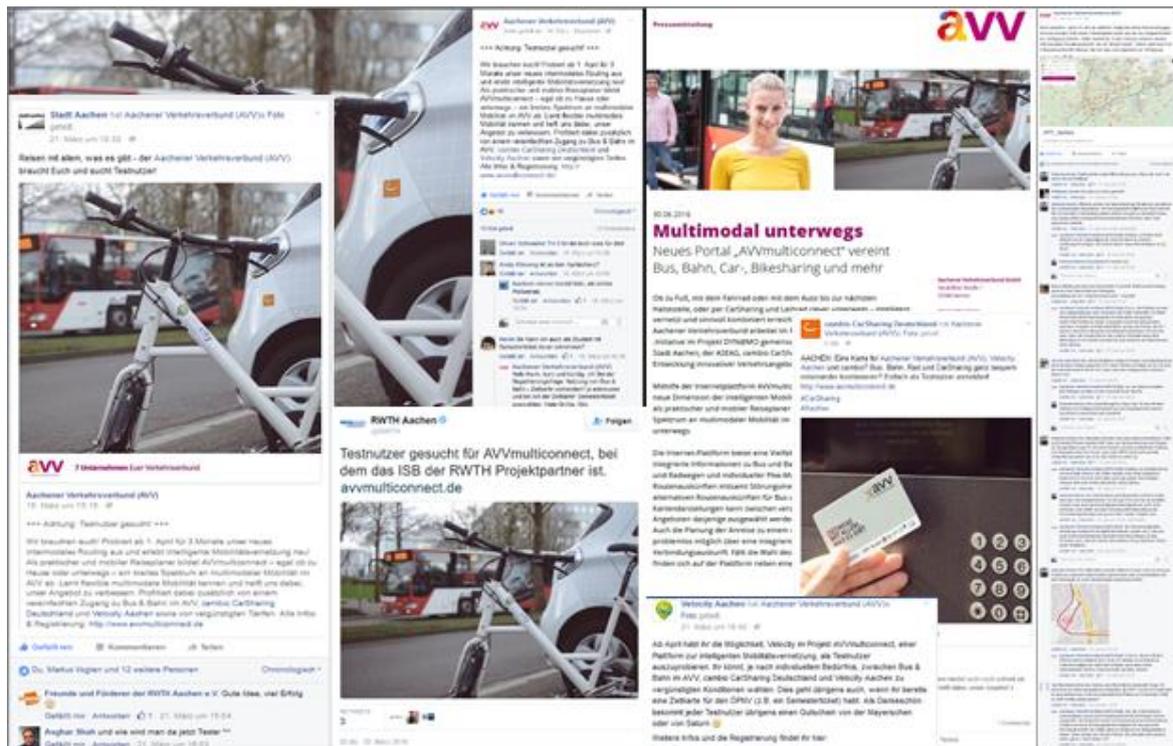


Figure 20: Collage of dissemination activities in relation to the Mobility Alliance

The release of a leaflet describing information on the multimodal routing platform and the travel assistant information has been postponed to November 2016 to promote both aspects with a greater impact.

6 Measure Evaluation

To evaluate the project, the data on the use of the offers and the users' opinions on the offers were surveyed. These are being analysed and interpreted at this time by RWTH University. The results are included in the corresponding internal working document. In the present report, a few statistics and initial results are described below in excerpts.

6.1 Utilisation statistics of the mobility platform

The mobility platform, without multimodal information on traffic connections, which is provided via a separate page, had approx. 23,000 page views per month (each subpage of the website is counted separately here). In 60% of the cases, the page was called up in a desktop browser, otherwise in a mobile browser, 71% of which were browsers running on an Android system and the others such running on iOS.

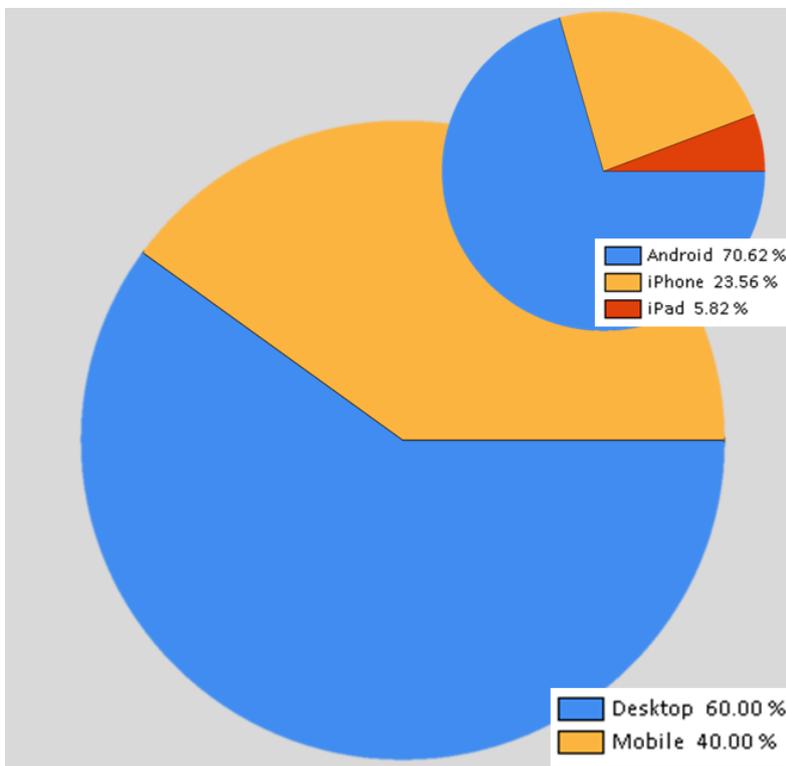


Figure 21: Percentage of browser types used for page views of the mobility platform without the page with information on traffic connections

The multimodal connection information system runs on a separate website, in order to keep the performance at the highest possible level. The page can be called up by the user either directly or from the mobility platform. On average, it had approx. 26,000 page views per month. Access was made by 250 different visitor devices per month, while 60 page views were executed on average in each visit of the page, i.e. different details were clicked on or selected and viewed in the information. These visits to the information system to retrieve various information were short in most cases. The time spent in a visit was less than 30

seconds in half the visits, another 25% of visits lasted less than 5 minutes and the remaining visits more than 5 minutes.

6.2 Utilisation statistics of the mobility offers

Overall, 68 test users could take advantage of all mobility services offered by bus and railway in the AVV, car sharing in the region of Aachen, and bike sharing in the city of Aachen at any time during the pilot phase. The use of season tickets cannot be recorded, as there is no electronic access control in the AVV. This electronic access control is presently being set up (also see Section 7). Most of the test users (56) had a season ticket. Merely 13 test users wanted to use a mobile phone ticket for possible trips by public short-distance transport. Nearly half of them (6) used a mobile phone ticket during the three-month test phase. On average, they purchased 2.2 tickets per person and month (May-July). This clearly illustrates rare occasional use. They usually purchased AVV tickets and seldom tickets of other transport associations. Most of the purchased AVV tickets were 4-ride tickets, which is a price-aware choice.

28 test users used the car sharing offer during the test phase and thereby took together 130 trips. On average, 14 test users took altogether more than 40 trips per month with cambio, which is 2.9 trips per user. On average, they travelled 7.8 hours per month at 11.4 km per hour. They are thereby clearly above the average for cambio customers of the "start tariff" (2 hours/month at 8 km/hour) and closer instead to the cambio customers of the "active tariff" (12 hours/month at 8 km/hour). The test phase went absolutely smoothly in terms of the cambio use. There were merely two cases where the safe with the car key did not open with the new chip card; this minor technical problem was directly corrected by cambio and use could be continued without problems.

For the testing of the new Velocity offer, 19 test users took together 33 trips. 7 test users took together 11 trips per month with Velocity on average, which is 1.4 trips per user. 15% of the 33 trips were canceled because errors while riding or returning occurred. Nearly 20% of the trips lasted less than 1 minute, that is, it has only been tested to see if the renting process works. Without these cancelled rides and rides under 1 minute, on average, the test users travelled 17 minutes per trip in the first month; the rental period was already 35 minutes per trip in the second and 52 minutes per trip in the third test month. It was problematic in the use of the Velocity offer that the offer is still in the start-up phase and numerous technical problems occurred. On the one hand, in the beginning of the test phase, there were only 2 stations that were only 650 metres away from each other. One month later, the third station was opened 3.5 km away, so that the test could be attributed to actually travelled distances. In addition, the stations were equipped with a vastly differing number of pedelecs. At the first two stations, merely one to two bicycles was available and at the third station there were five bicycles available. Furthermore, technical problems occurred frequently. The bicycles were sometimes released for renting in not charged conditions, so that the support no longer worked after just a few kilometres and the heavy pedelecs could only be returned to the station with difficulty. The chip card was often not detected correctly or the complete rental terminal was unavailable, so that no bicycles could be borrowed.

6.3 Quantitative online survey

In order to evaluate the Mobility Alliance in the test phase, the users were invited to participate in an online survey during the pilot phase on 30 June 2016. On 07 July 2016, they received a reminder for the survey participation. The survey was completed on 12 July 2016. The participation in the survey was voluntary. The users received a voucher in the value of EUR 15 as an incentive. This way, a total of 73 people participated in the survey, 60% of whom are professionals and the remaining participants are students.

The survey was conceptualised by the Institute of Urban and Transport Planning (ISB) at RWTH Aachen University. The survey also included questions on the evaluation of measure A3.2 "Travel assistance – individualised notification system" and was therefore conducted together with the Center for Learning and Knowledge Management (ZLW) of the Cybernetic-Cluster IMA/ZLW & IfU at RWTH Aachen University.

Nearly all survey participants know the mobility platform and 85% of them have already visited it. However, it is used at least once a week by merely 23%, while more than 50% use it less frequently and 21% never. The most common reason for this is the use of other information portals or media, for which purpose smartphone apps are used very frequently.

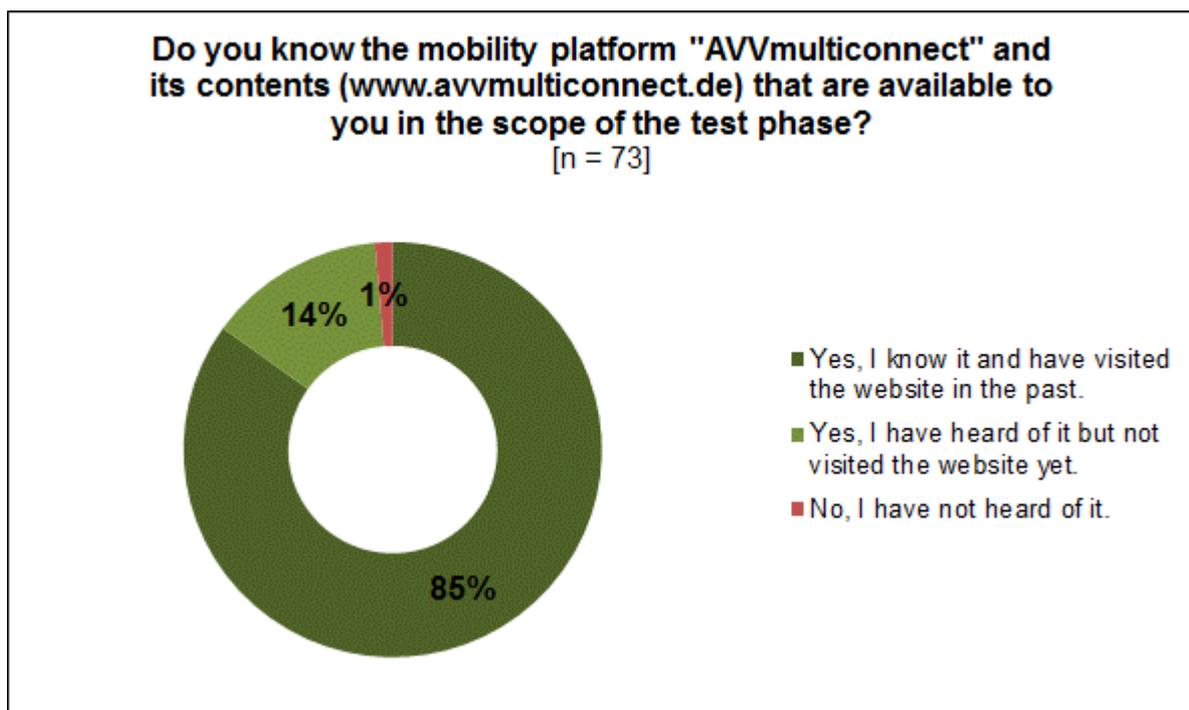


Figure 22: Publicity of the mobility platform

By far most frequently used is the mobility profile for the connection information, while the components for trips to long-distance transport and parking in Aachen are used very rarely. Except for parking in Aachen, all components are assigned high satisfaction ratings. The particular aspects of the multimodal connection information are likewise evaluated as being helpful overall.

Three-quarters of the test users evaluate the offer of using several means of transport in the alliance as very good to good. The mobility offers for bus and railway, as well as cambio were received with satisfaction by the test user within the scope of the pilot phase. The Velocity offer finished rather poorly due to the described problem (see Section 6.2). The decisive reason was the very small number of stations. In addition, many test users stated that Velocity did not react to enquiries by email and phone.

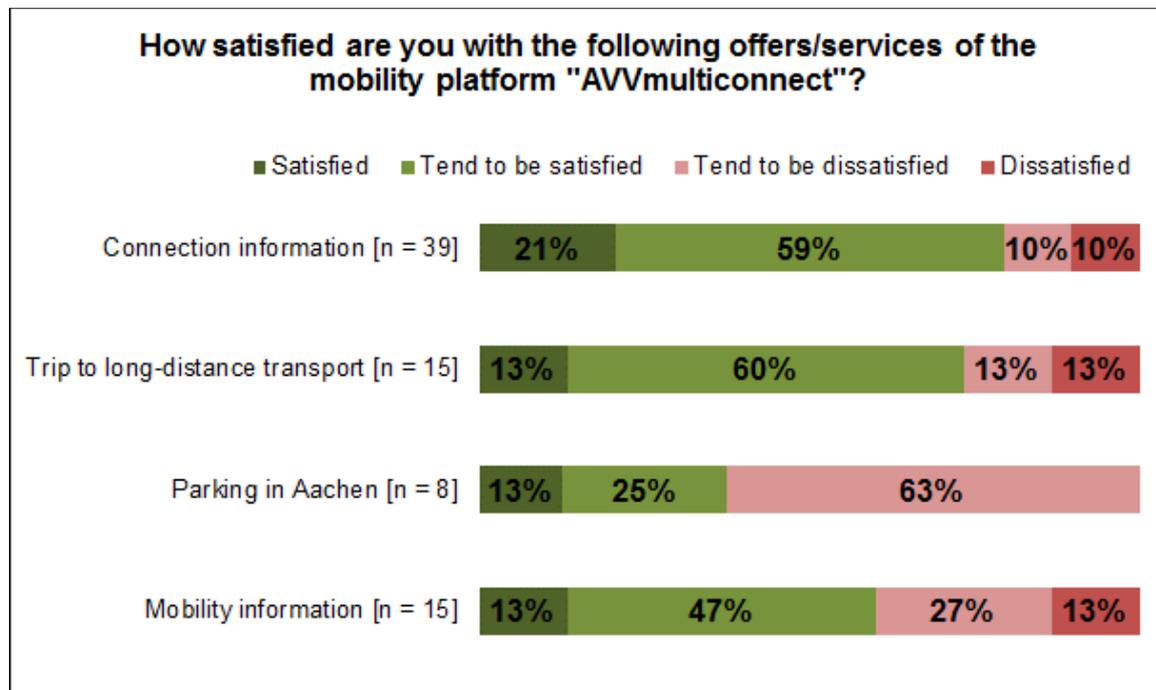


Figure 23: Satisfaction with the mobility profiles

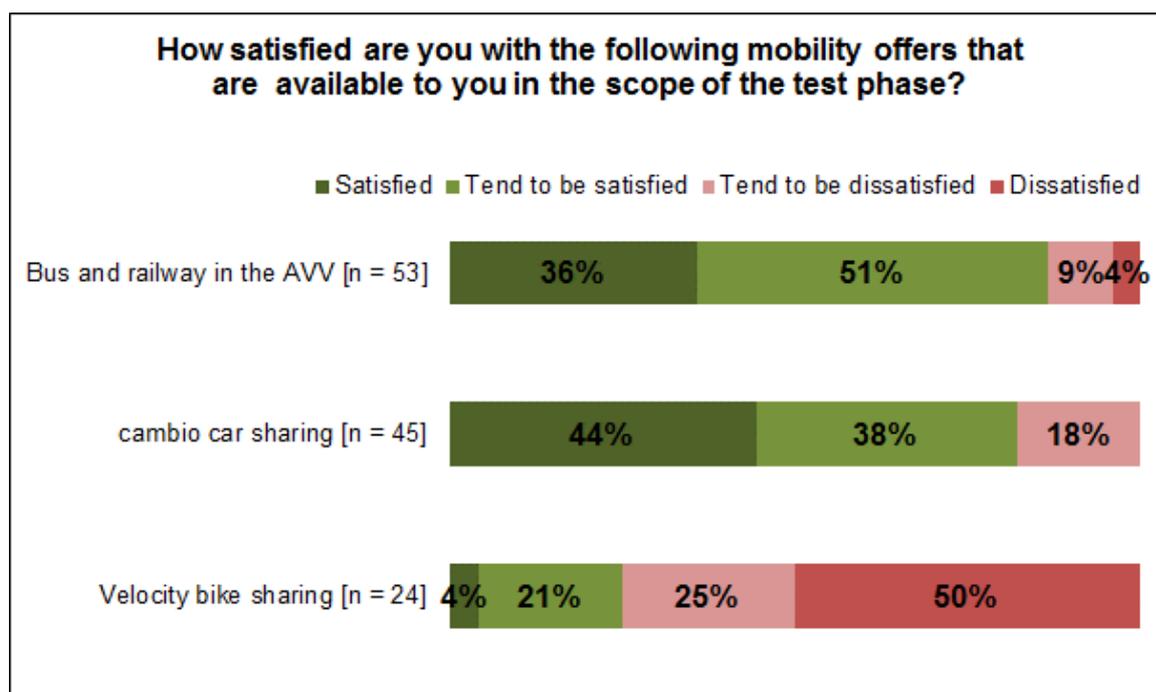


Figure 24: Satisfaction with the mobility offers

From the perspective of the test users, the shared chip card simplifies the use of the different means of transport and becomes even more interesting when it can be used as a ticket for bus and railway. In fact, it is the shared chip card that was liked best by the test users and it is what would most likely move them to change their mobility behaviour. The majority of test users (80%) would furthermore welcome if the mobility platform also becomes, besides the multimodal information system, a standardised booking platform for the means of transport in the Mobility Alliance.

Further survey results of the comprehensive questionnaire with more than 60 questions are currently being analysed, interpreted and recorded in an internal working document. The survey results are used to adjust and improve the provision of information and connection information, as well as the concept of the Mobility Alliance to the customer requirements.

7 Conclusion and Outlook

With the introduction of a Mobility Alliance in Aachen in measure A3.1 “Mobility Alliance”, local mobility providers for bus, trains, car sharing and pedelec sharing worked together in order to develop a mobility platform for the regional transport market and to offer multimodal and intermodal mobility options for citizens. As a first step a market analysis was conducted. On this basis, a first Mobility Alliance concept was elaborated, including various organisational, financial, technical and legal issues. In the implementation the pilot phase of a Mobility Alliance with 100 test users was carried out from April to July 2016. The test users tried a simplified integrated access to buses and trains as well as the city’s car sharing and pedelec sharing schemes, including joint registration and chip card access to the car sharing and pedelec sharing vehicles. In addition, a new multimodal information and routing platform has been introduced by AVV, available from www.avvmulticonnect.de. Through the work in the project the cooperation of the mobility service providers was strengthened. With these elements the objectives of the measure were full filled. In the survey conducted as part of the measure evaluation, the test users stated among others:

- The multimodal trip planer is satisfying (80%)
- Using different modes of transport in the mobility alliance is (very) good (76%)
- The idea of one multimodal booking platform is (very) good (90%)
- A joint access via chip card as the key to behaviour change (78%)

Following the pilot phase, the technical tests of the multimodal connection information system are continued and the mobility platform is being developed further by means of the experiences and survey results. It is planned that the regular connection information for bus and railway in the AVV will be replaced by the multimodal connection information system in the summer of 2017. In parallel, the Mobility Alliance is being developed further. New mobility offers, e.g. carpooling, long-distance coaches and taxis, can be integrated in both the information as well as the Alliance. Likewise at the same time, the electronic transport fare management will be introduced in the AVV, whereby initially all season tickets can be put out on chip cards and mobile devices as of 2017, and also all other public transport tickets and access rights for other mobility services from 2018 onwards. Besides the mobility information, also the booking and billing for other mobility offers will then be enabled on one online platform.

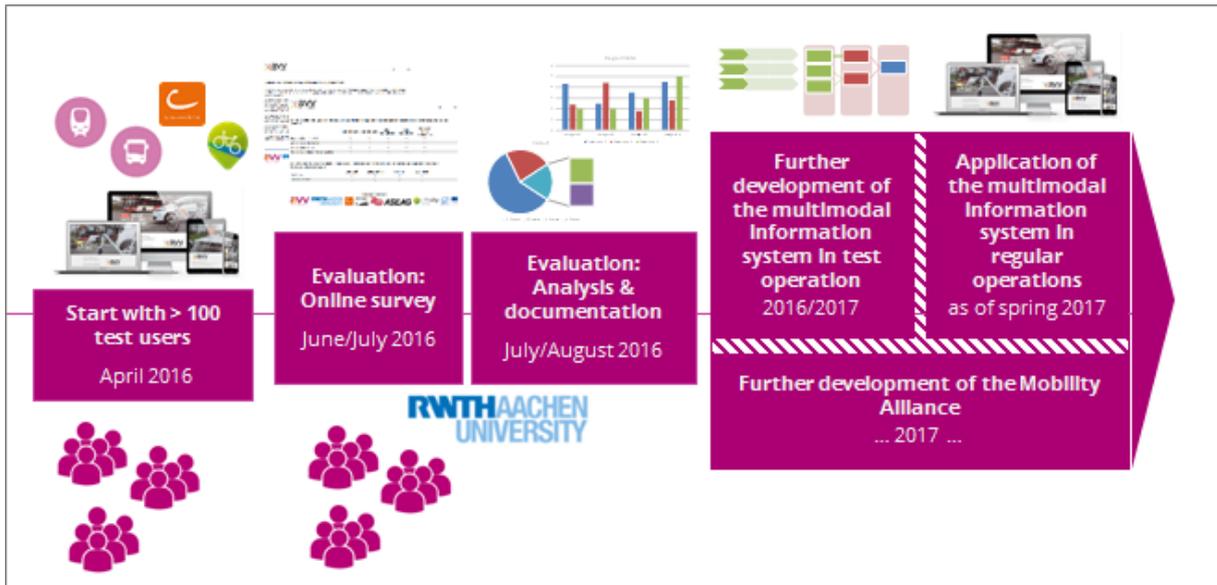


Figure 25: Schedule of the pilot phase and further development

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