

The usage behaviour and perception of public on-demand transport based on three examples in the province of Salzburg, Austria

Based on the previous work of the Institute of Transport Studies at the University Bodenkultur (BMK Endowed Chair for Digitalisation and Automation in Transport and Mobility Systems) on the topic of demand-responsive transport, the question was raised together with representatives of the Austrian province of Salzburg: How are these services used and perceived in the region? This includes both users and non-users of the service, who in turn are made up of locals, commuters, tourists and visitors to the region. This question was investigated on the basis of three case studies, which are embedded in different framework conditions, and the results will be summarised in this presentation. All three case studies are located in different regions in the Austrian province of Salzburg (W3 shuttle, Walsie bus and Loigom shuttle). In principle, there are some differences in the type of service and the framework conditions between the case studies. The most obvious difference is that one service runs according to a timetable, whereas the other shuttles have a flexible timetable based on demand indications. The survey showed that the services are well established in the region, so the majority of non-users are also aware of the service and the majority of respondents think the service is good (78% W3 shuttle, 66% Walsie bus and 80% Loigom shuttle). The shuttle is primarily used for leisure purposes, 42% for the Loigom shuttle, 22% for the Walsie bus and 48% for the W3 shuttle. About every second journey was made by occasional users, which is the proportion of users travelling with a single trip ticket. The survey confirmed, the contribution of the W3 shuttle to tourists' choice of transport both at site and for arrival is remarkable. The local traffic effect is also noticeable. For example, 54% of Loigum-Shuttle users, 42% of W3-Shuttle users and 34% of Walsie Bus users stated that they would have made their last journey made with the on-demand bus by car if the service had not existed. The investigation of the three successful services showed success factors for on-demand transport, which are: (1) the clear (also financial) commitment of the municipalities; (2) the operation of the service by a professional operator from the taxi/bus sector; (3) the use of vehicles with a capacity of up to 8 passengers, including flexible increases in the number of vehicles in the event of peaks in demand; (4) the exclusion of school transport; (5) the recognition of transport association tickets and other regional network tickets; (6) the coordination and connection of the service to the superordinate transport system; (7) the complete integration of on-demand transport into route planning systems (beyond the shuttle's service area) and (8) operation on all days of the week. The delineation of the service area is an important planning decision and has an influence on the minimum time between the ordering process and the execution of the journey. Municipal boundaries are less important than the necessary journey times within the service area and connection points to the superordinate public transport network. These should therefore not be longer than a pre-order time of 60 minutes (preferably 30 minutes) allows. The division into several areas/zones is certainly an option and is used on the W3 shuttle and Walsie bus. In operation, every effort must be made to ensure that (potential) passengers have the confidence that their journey request will be fulfilled. This is the only way to create a regular clientele (also indirectly, by recommending

1 *existing users or multipliers such as accommodation providers for their guests)*
2 *that can justify operation in the long term.*

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4 **Keywords:** *Public on-demand transport, rural area, Austria, user behaviour,*
5 *user perception*

8 **Introduction**

9
10 Based on the previous work of the Institute of Transport at the BOKU
11 University Vienna (BMK Endowed Chair for Digitalisation and Automation in
12 Transport and Mobility Systems) on the topic of demand-responsive transport, the
13 question was raised together with representatives of the Austrian province of
14 Salzburg: How are these services used and perceived in the region? This includes
15 both users and non-users of the service, who in turn are made up of locals,
16 commuters, tourists and visitors to the region. This question was investigated on the
17 basis of three case studies, which are embedded in different framework conditions,
18 and the results are summarised in this paper. All three case studies are located in
19 different regions in the province of Salzburg: the W3 shuttle in Pongau region
20 (municipalities of Werfen, Werfenweng and Pfarrwerfen), the Walsie bus in
21 Flachgau region (municipality of Wals-Siezenheim) and the Loigom shuttle in
22 Pinzgau region (municipality of Leogang). In principle, there are some differences
23 in the type of service and the framework conditions between the case studies (see
24 also Table 1)

25 The most obvious difference is that the W3 shuttle runs according to a
26 timetable, whereas the Walsie bus (Figure 1) and the Loigom shuttle (Figure 2) have
27 flexible timetable based on demand indications. This means that the route of the W3
28 shuttle is also (roughly) predetermined. With the Walsie bus, this is only specified
29 by zones within which the route is generated. The Loigom shuttle has neither a route
30 nor a zone division. On the demand side, the biggest difference is that tourism plays
31 a significant role in the service area of the W3 shuttle and the Loigom shuttle, which
32 is only of secondary importance for the Walsie bus.

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1 **Figure 1.** *Walsie Bus, picture: Gregor Husner*2
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5**Table 1.** *Supply characteristics of the on-demand transport services at the time of the survey*

	W3 Shuttle	Walsie Bus	Loigom Shuttle
Operator	Taxi company on behalf of the local authority	Taxi company on behalf of the local authority	Taxi company as subcontractor of public transport operator on behalf of the transport association
Vehicles	8-seater	8-seater, electric drive	8-seater, electric drive
Dispatching	of journey planning centre	drivers on their own responsibility	automated with app support
Operation scheme	timetable based, door to stop/stop to door	only defined operating times, stop to stop	only defined operating times, stop to stop
Operating days	Mon - Sun	Mon - Sun	Mon - Sun
Operating hours	6:10-22:30	8:00-21:00	8:30-19:30 with a break 11:30-12:30
Minimum order time	1 hour	30 minutes	30 minutes
Standard price single journey ticket	€ 2.70 (2022)	€ 1.00 (2022)	€ 1.00 (2023) then € 2.20
Regional season tickets (e.g. SVV, Klimaticket)	recognised, plus tourist card	recognised	recognised, plus tourist card

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1 **Figure 2.** *Loigom-Shuttle, picture: Roman Klementsitz*2
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45 **Case study W3-Shuttle**

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7 The shuttle is operated by a professional taxi company. The buses are normally
8 8-seater buses, but if necessary, when larger groups book a journey, the company
9 can also use coaches to cover the demand. Dispatching is carried out via a control
10 centre, which sends the drivers a precise route in the form of addresses and the order
11 in which they are to be approached. The W3-Shuttle offers passenger transport from
12 a desired address within the respective service area to the intended destination (train
13 stations and town centres) and vice versa. Journeys from one specific address to
14 another or a journey from one station to another are not possible. Special seats for
15 children and bicycle transport must be reserved when booking the journey, but are
16 generally possible. Single tickets (€ 2.70, as of 2022) and season tickets for the W3
17 shuttle are available in the vehicle. Children under 6 travel free of charge, young
18 people aged 6 to 15 pay the youth rate. Skiers from Pfarrwerfen, Werfen,
19 Werfenweng and Tenneck use the W3 shuttle free of charge for the journey to
20 Werfenweng Zaglau ski centre (during the operating hours of the Werfenweng cable
21 cars). Holiday guests with the Werfenweng Card also use the W3 shuttle free of
22 charge. Myregio season tickets of the Salzburg Transport Association are valid, as
23 well as the Climate Ticket, SUPER s'COOL Card and the Edelweiss Ticket.

24 The lines have a fixed timetable and the stops are only served if journeys have
25 been booked in advance. It is therefore not possible to travel without pre-booking.
26 The advance booking time is one hour (all journeys before 08:00 must be booked
27 by 22:00 the day before). The timetable times are approximate, the exact pick-up
28 time will be given when the journey is pre-ordered. The pick-up time usually
29 deviates from the timetable by a few minutes, as it can take a few minutes to pick
30 up from different addresses in a town. However, connections to the railway

1 (Bischofshofen, Werfen and Pfarrwerfen) are guaranteed. The journey times of the
2 W3 shuttle are coordinated with the journey times of the trains. Depending on the
3 zone, the service starts between 6.10 am and 7.30 am and ends between 6.40 pm
4 and 10.30 pm. The W3 shuttle runs daily, the service does not differ between
5 Sundays and public holidays and weekdays.
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8 **Case study Walsie-Bus**

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10 The operator of the Walsie bus is a local bus company. 8-seater electric buses
11 are used. They are dispatched by the drivers themselves. The service area is divided
12 into three zones (zones with different colour codes). If the journey covers more than
13 one zone, the passenger must change bus depending on the current capacity
14 utilisation (each bus primarily travels in 'its' zone, but if demand allows, transfer-
15 free connections to other zones are also offered). This change is coordinated by the
16 drivers among themselves, however such journey requests are the exception. If a
17 direct transfer is not possible, passengers change to another Walsie bus at the
18 municipal office in the village centre. The Walsie bus does not travel to any desired
19 addresses, but has a number of predefined stops throughout the area that are served
20 (currently 82 stops in the service area). A journey is only possible from stop to stop.
21 The stops were determined by a survey prior to the introduction of the Walsie bus
22 and can be adapted if necessary (e.g. a new stop or a relocation of an existing one).
23 The operating times are the same for all zones Monday to Saturday from 08:00 -
24 21:00 and on Sundays and public holidays from 08:00 - 17:00. Passengers must
25 arrange the pick-up time and stop at least 30 minutes before the desired departure
26 time. The fare (as of 2022) for a one-way journey is €1.00 for adults and €0.50 for
27 children and senior citizens. Children are those up to the age of 14, senior citizens
28 are those aged 62 and over. There are also blocks of 10 and 30 tickets available. The
29 SVV annual ticket of the Salzburg Transport Association is recognised.
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32 **Case study Loigom-Shuttle**

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34 The Loigom shuttle is operated on the basis of an contract from the transport
35 association in coordination with the Pinzgau public transport authority and the
36 municipality of Leogang, as is the conventional scheduled service in the region. The
37 contractor is the bus company Postbus. The Loigom shuttle is operated by a local
38 subcontractor for Postbus. Two specially branded electric vehicles were purchased
39 to operate the Loigom Shuttle. The vehicles are 8-seater Mercedes eVito buses.
40 Journeys are scheduled using an electronic system called 'Postbus Shuttle'. An app
41 shows the driver the navigation to the next start/journey destination with the stop
42 name, number and names of the people to be transported and any ticket price to be
43 charged. The Loigom Shuttle offers passenger transport between around 40 fixed
44 stops within the service area as required. The journey takes place as soon as possible
45 or at a fixed time, depending on availability. The stops are located in the centre of
46 the different settlements in Leogang, additionally at the railway stations Leogang,

1 Leogang-Steinberge and Hochfilzen, as well as the Asitz and Steinbergbahn cable
2 cars, touristic destinations such as the Ullachtal car park as a starting point for hikes
3 and a show mine. Journeys from/to a specific address are not possible. Bookings
4 along the route of the bus line 690 can only be made as a frequency booster. A
5 request for a parallel service along the bus line with the same time slot is not
6 possible. Passengers are asked to use the conventional bus instead of. The Loigom
7 Shuttle does not have a fixed timetable; the stops are only called at if journeys to or
8 from them have been booked in advance. It is therefore not possible to travel without
9 pre-booking. The pre-booking time is 30 minutes, but late bookings are also possible
10 if the shuttles are available. The pick-up time which is communicated after a
11 booking is a guideline and can vary by a few minutes. The Loigom shuttle runs daily
12 Monday to Friday: 08:30 to 11:30 and 12:30 to 19:30 and on Saturdays, Sundays
13 and public holidays: 08:00 to 18:00. The Loigom shuttle is integrated into the SVV
14 (Salzburger Verkehrsverbund) fare system. Regionally valid tickets, such as the
15 Klimaticket Salzburg or Austria as well as the (SUPER) s'COOL-CARD and the
16 myRegio FerienCARD are recognised and allow one to travel without any
17 additional charge. The touristic Saalfelden-Leogang Card is also recognised. This
18 Pinzgau mobility card for holiday guests enables public mobility in Leogang and
19 throughout Pinzgau at no extra charge. A one way ticket (single ticket) for a journey
20 on the Loigom Shuttle can be purchased directly on the bus and cost € 1.00 during
21 the survey period. After the promotional period from the beginning of 2023 to
22 December 2023, during which the single tickets were discounted as a community
23 ticket, they cost €2.20 (as of 2023), like a ticket for a zone in the public transport
24 network area. Children under the age of 6 travel free of charge.

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27 **Survey procedure**

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29 A survey of users and non-users was conducted in each service area, and two
30 at different times of the year for the W3 shuttle (summer and winter season). The
31 survey resulted in valid data sets: W3-Shuttle: Wave 1: n=227 (September 2021) -
32 W3-Shuttle: Wave 2: n=238 (February 2022); Walsie Bus: n=198 (February 2022)
33 and Loigom-Shuttle: n=248 (July 2023). A paper and an online version of the
34 questionnaire were offered, each with different versions for locals and for
35 tourists/visitors (the latter also in English). It was possible to self-administer the
36 questionnaire on paper (distribution at several points in the service area), as an
37 online version (web link via QR code) or as a personal interview on site.
38 Recruitment took place on site at well-frequented points, in the vehicles of the on-
39 demand services, in schools, in the medical centre, in social media, by e-mail, by
40 means of paper questionnaires, which were available at various locations. Several
41 options were offered for returning the completed paper questionnaires, mostly at the
42 points where the questionnaires were available, at the municipal office, to the bus
43 drivers or directly to the interview staff.

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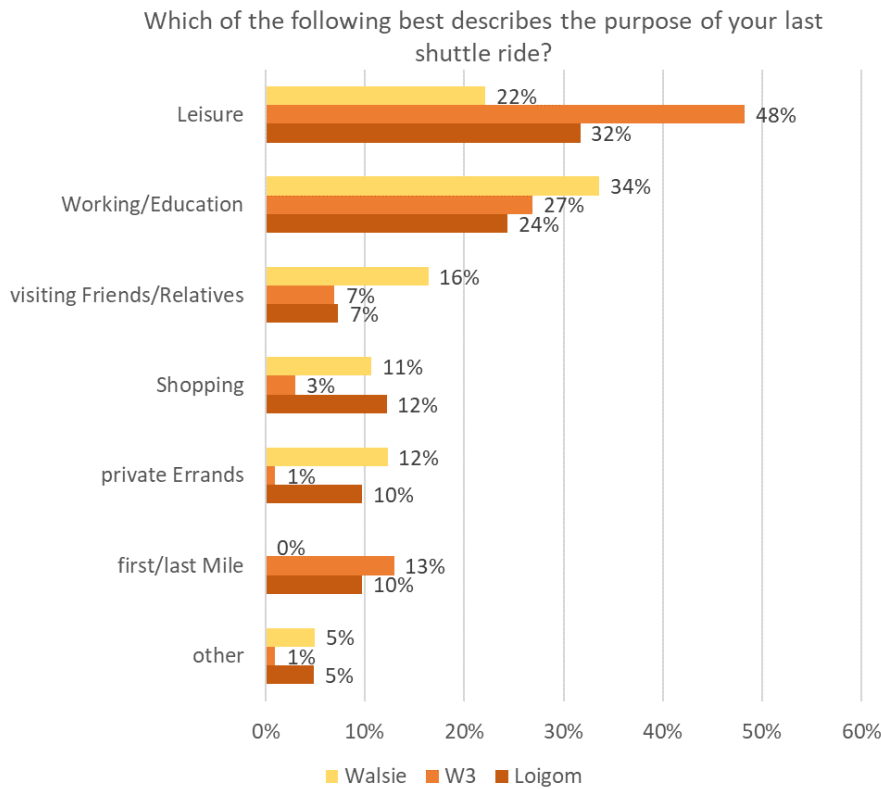
1 **Utilisation patterns and alternatives**

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3 Figure 3 shows the distribution of the purposes of journeys on the shuttles. With
4 the Walsie bus, the purposes of journeys are more varied than with the other shuttles.
5 22% of respondents use the Walsie bus for leisure activities, 34% for work or
6 education (made up of 17% for work and 17% for education), 16% to visit
7 family/friends and 12% for private errands (e.g. doctor, authority, hairdresser) and
8 11% for shopping. In contrast, the proportion of leisure journeys is dominant for the
9 W3 shuttle, with around half (48%) of respondents using the shuttle to get to and/or
10 from leisure activities (24% for hiking or winter sports and 24% for other leisure
11 activities). 27% for travelling to work or education (made up of 16% for work and
12 11% for education purposes). In addition to leisure journeys, the shuttle is used as
13 the first or last part of a (long-distance) journey (first/last mile), accounting for 13%
14 of journeys. These results clearly show the relevance of the service for the leisure
15 sector. Shopping and private errands hardly play a role with the W3 shuttle. The
16 Loigom Shuttle lies functionally between the two other on-demand services. At
17 32%, the proportion of leisure journeys is also the highest, but less dominant than
18 for the W3 shuttle. For a further 10%, the shuttle is used as the first or last part of a
19 (long-distance) journey (first/last mile). Around a quarter (24%) of journeys were
20 to/from work; there were no journeys to/from educational institutions. 12% of
21 respondents used the shuttle for shopping and 10% for private errands, proportions
22 that are comparable with the Walsie bus.

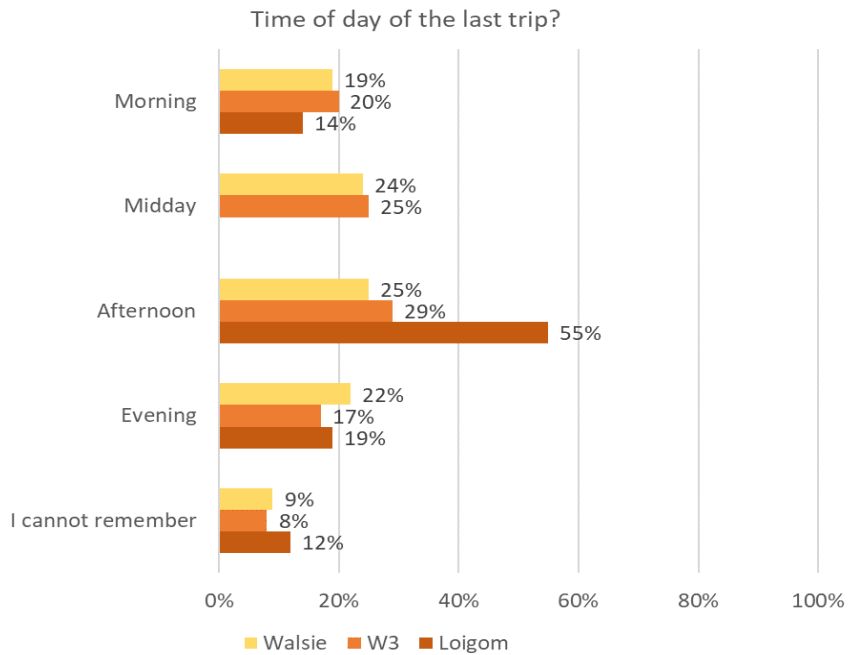
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25 there were no journeys to/from educational institutions. 12% of respondents used
26 the shuttle for shopping and 10% for private errands, proportions that are
27 comparable with the Walsie bus.

28 Figure 4 shows the distribution of daytime of the requested trips. The shape of
29 the distribution is similar across all the services with a peak at the afternoon,
30 increasing from the morning time and declining toward the evening. As there is no
31 service available around midday at the Loigom shuttle, those trips were shifted
32 towards the afternoon primarily, which causes a clear demand peak at this service.

1 **Figure 3.** *Distribution of journey purposes for journeys with the shuttle (survey*
 2 *2021/22 W3 shuttle, 2022 Walsie bus, 2023 Loigom shuttle)*



3 **Figure 4.** *Distribution of the time of day of journeys with the shuttle (survey 2021/22*
 4 *W3 shuttle, 2022 Walsie bus, 2023 Loigom shuttle)*

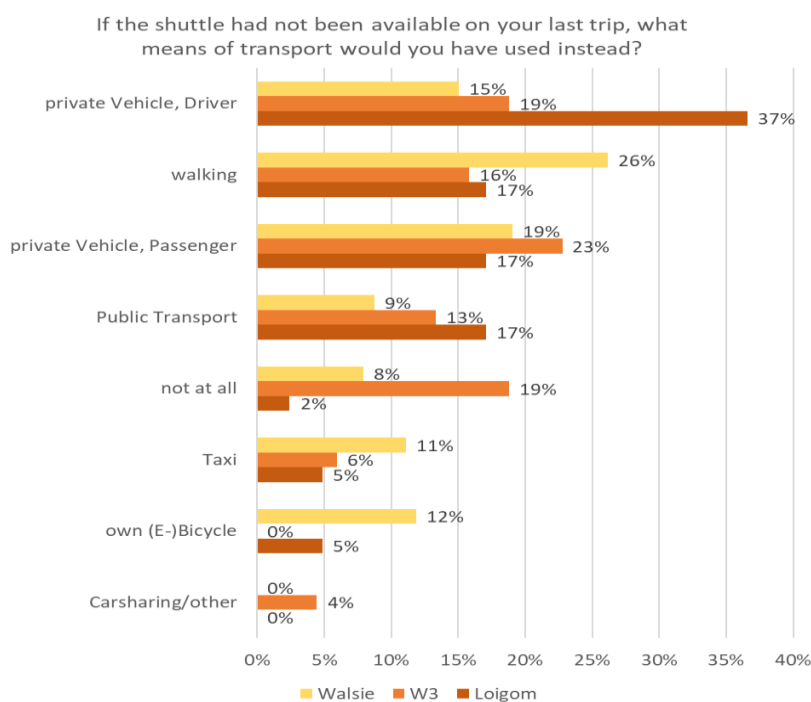


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1 Figure 5 shows the distribution of whether and how the journey would have
 2 been made if there had been no on-demand transport service available. In the case
 3 of the Walsie bus, 35% of journeys would have been made by private car (19% as
 4 driver and 15% as passenger), a further 11% by taxi. 9% of respondents would have
 5 travelled by public bus. Some journeys were also made by non-motorised
 6 alternatives (26% on foot and 12% by (e-)bicycle). 8% of respondents would not
 7 have been able to make the journey at all. The picture is similar for the W3 shuttle,
 8 with motorised alternatives being slightly more common due to the longer distances
 9 travelled in the service area (42% by private car and 13% by conventional public
 10 transport). Non-motorised means of transport are correspondingly less likely to be
 11 considered as an alternative (16% walking, the (e-)bicycle is not mentioned at all).
 12 The Loigom shuttle stands out with a value of 37% due to the high proportion of
 13 private cars as drivers, as well as conventional public transport with 17%. Only 2%
 14 of passengers in Leogang would not have travelled the route at all. These results
 15 show the contribution of on-demand transport to the reduction in journeys by private
 16 motorised transport, which outweighs the effect of passengers who would otherwise
 17 have used bicycles or walked. In addition, studies show that one journey as a
 18 passenger can generate up to 4 journeys by car if the accompanying person, who
 19 drives the vehicle, only makes the journey as a pick-up and drop-off journey,
 20 additionally driving home in between (Klementschtz, Wurz 2010, Klementschtz,
 21 Schlemmer 2022). Another effect is the higher occupancy rate of on-demand
 22 transport than that of individually used motorised vehicles, which further reduces
 23 energy consumption.

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25 **Figure 5.** Alternatives to travelling by shuttle (survey 2021/22 W3 shuttle, 2022
 26 Walsie bus, 2023 Loigom shuttle)



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1 **Differences between users and non-users**

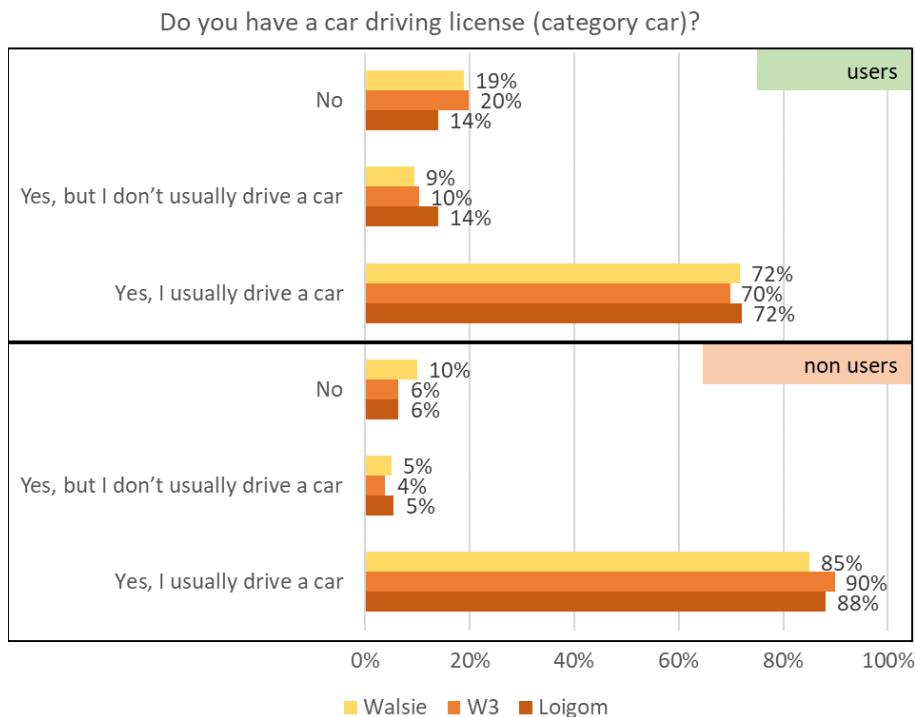
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3 Figure 6 shows the distribution of driving licence ownership, differentiated
 4 between users and non-users of on-demand transport. A difference between the two
 5 groups is recognisable here. While between 85% and 90% of non-users have a
 6 driving licence and regularly drive a car, depending on the region, this figure is only
 7 between 70% and 72% for users. These results show the contribution of on-demand
 8 transport to an inclusive mobility offer.

9 The questionnaire asked a series of questions regarding the respondents'
 10 satisfaction with topics related to on-demand transport (Figure 7). There were also
 11 specific questions for users included they have already used the on-demand
 12 transport. These included the question of whether they would like to use the service
 13 again (agreement between 89% and 100%), whether they would recommend the
 14 service to others (agreement between 84% and 93%) or how satisfied they were with
 15 using it (agreement between 66% and 80%). All those reached were asked whether
 16 they were familiar with the service (agreement between 29% for the relatively newly
 17 established Loigom shuttle and 66% or 76% for the other on-demand services). In
 18 general, 59% in the area served by the W3 shuttle and Loigom shuttle and 49% in
 19 the area served by the Walsie bus are 'satisfied' or 'very satisfied' with the public
 20 transport services in the region.

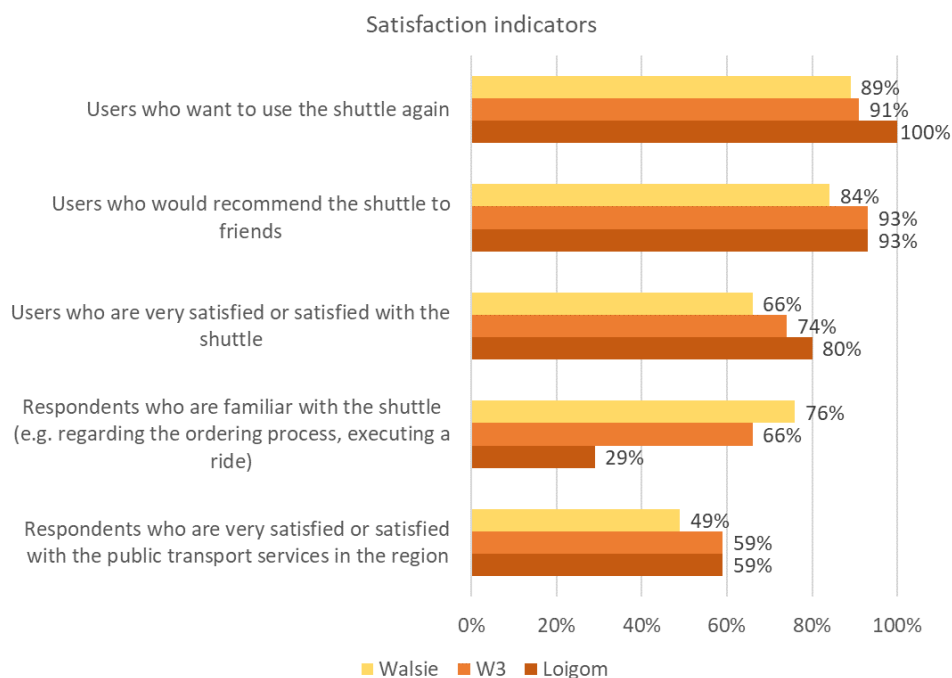
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22 **Figure 6.** *Driving licence possession of users and non-users of the shuttle (survey*
 23 *2021/22 W3 shuttle, 2022 Walsie bus, 2023 Loigom shuttle)*



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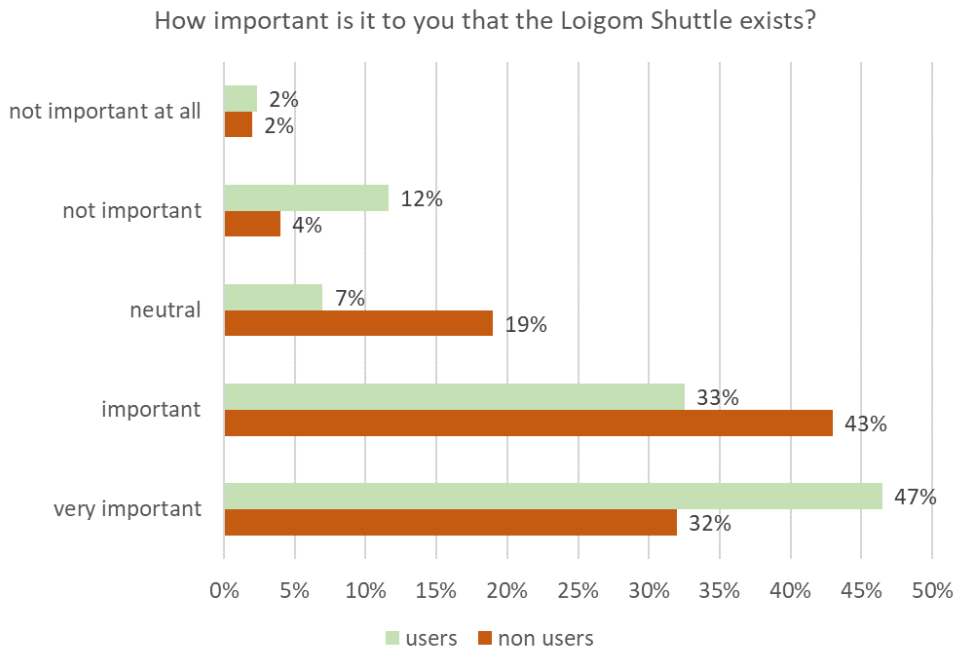
1 **Figure 7.** Key figures on satisfaction with the shuttle and public transport services
 2 (survey 2021/22 W3 shuttle, 2022 Walsie bus, 2023 Loigom shuttle)



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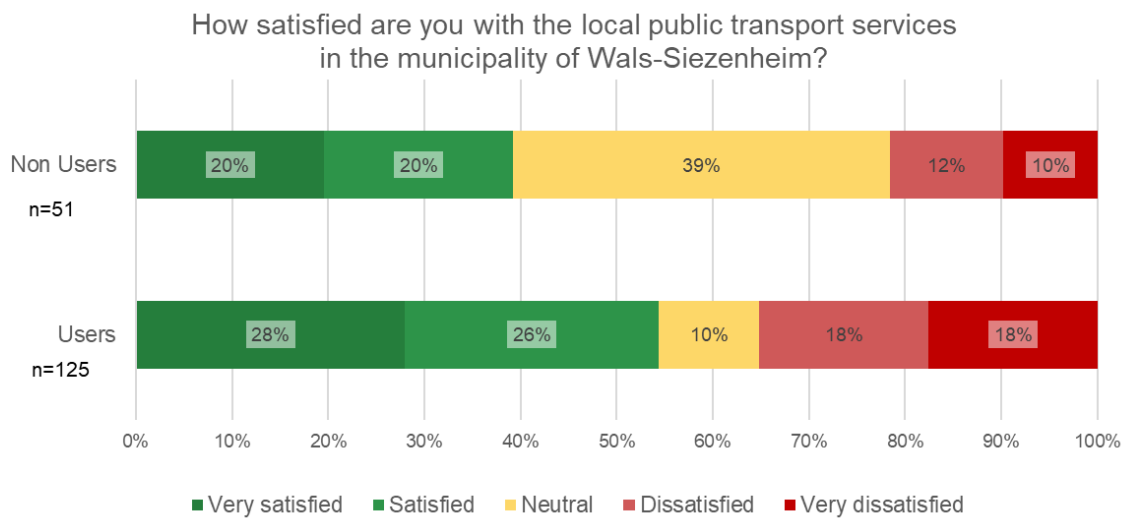
Subsequently, some analyses were carried out on differences between users and non-users. Figure 8 shows the answers to the question of the importance of the service in the Leogang region (Loigom shuttle). As expected, users generally rate the importance of the service higher than non-users. However, the offer is also important to non-users (as an optional service), so the approval ratings for ‘important’ and ‘very important’ together differ only slightly (80% for users and 75% for non-users). This is understandable for two reasons. On the one hand, non-users may also be dependent on public transport and here the Loigom shuttle offers an important contribution for the first and last mile as well as for internal transport in the municipality. On the other hand, non-users also benefit from the service if people can use the Loigom shuttle and do not have to be transported by themselves (e.g. their own elderly parents, elderly neighbours or their own children). Figure 9 shows a similar evaluation, in this case for the Wals-Siezenheim region. It presents the answers to the question about general satisfaction with the local public transport services in the municipality. In addition to the Walsie bus, the question also deliberately includes other means of transport, such as the city bus and the regional bus on scheduled services. Users of the Walsie bus users are more satisfied in general than non-users, who were taking a more neutral stance. Unfortunately, the sample is too small to make further distinctions, but it can be concluded for the non-users they are more likely have no need for public transport in the municipality at all than do not use public transport due to their dissatisfaction. More than half of all Walsie bus users are satisfied or very satisfied with the service in the municipality (54% in total).

1 **Figure 8.** *How important is it to you that the Loigom shuttle exists? Users and non-*
 2 *users (2023 Loigom Shuttle survey)*



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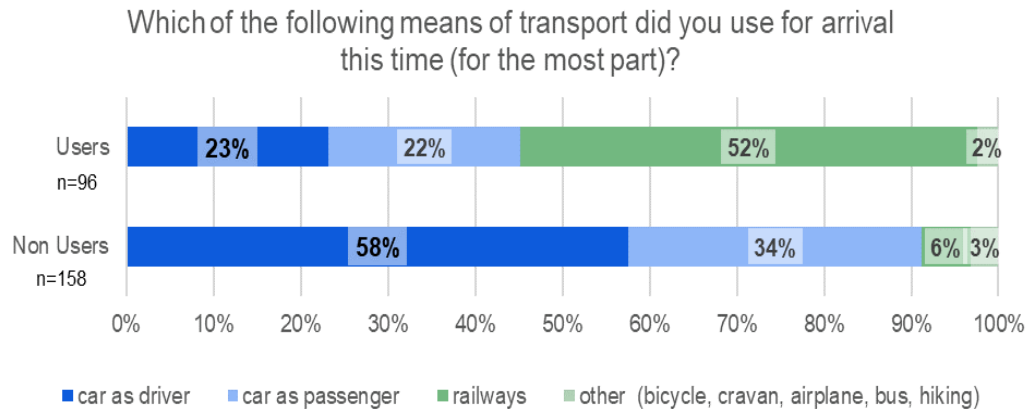
5 **Figure 9.** *How satisfied are you with the local public transport services in the*
 6 *municipality of Wals-Siezenheim, users and non-users (2022 Walsie bus survey)*



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9 Figure 10 shows the correlation between the selected means of transport for
 10 travelling to the municipality (for tourists, commuters, visitors) and the use of the
 11 W3 shuttle in the Werfen, Werfenweng and Pfarrwerfen region. It can be seen that
 12 due to the closure of the first/last mile and an adequate range of local mobility
 13 options, significantly more people travel by train (52%) than non-users of the service
 14 (6%). This means that the on-demand bus also has a positive effect on transport
 15 (emission) outside the region, far into the tourist origin areas.

1 **Figure 10.** *Choice of means of transport for travelling by tourists and visitors,*
 2 *broken down by users and non-users of the W3 shuttle, survey 2021/22*



3
 4 **Conclusion**

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 6 The survey showed that the services are well established in the region, so the
 7 majority of non-users are also aware of the service and the majority of respondents
 8 perceive the service is good (78% W3 shuttle, 66% Walsie bus and 80% Loigom
 9 shuttle). The shuttle is primarily used for leisure purposes - 42% for the Loigom
 10 shuttle, 22% for the Walsie bus and 48% for the W3 shuttle. About every second
 11 journey was made by occasional users, which is the proportion of users travelling
 12 with a single trip ticket. The contribution of the W3 shuttle to tourists' choice of
 13 transport is remarkable. In summer, the proportion of holidaymakers who travel by
 14 train and never use the shuttle service is 18% and in winter 6%. Among users of the
 15 W3 shuttle, the proportion travelling by train is significantly higher in summer at
 16 29% and in winter at 52%. The local traffic effect is also noticeable. For example,
 17 54% of Loigom-Shuttle users, 42% of W3-Shuttle users and 34% of Walsie Bus
 18 users stated that they would have made their last journey by on-demand bus by car
 19 if the service had not existed.

20 Successful on-demand transport should be cost-effective, accessible, easy to
 21 book and customer-orientated. Mobility needs should be handled in a flexible and
 22 reliable manner with on-demand transport. Success factors for on-demand transport
 23 are: (1) the clear (also financial) commitment of the municipalities (and in the case
 24 of the W3 shuttle and Loigom shuttle also of the tourism association); (2) the
 25 operation of the service by a professional operator from the taxi/bus sector; (3) the
 26 use of vehicles with a capacity of up to 8 passengers, including flexible increases in
 27 the number of vehicles in the event of peaks in demand; (4) the exclusion of school
 28 transport; (5) the recognition of transport association tickets and other superordinate
 29 network tickets; (6) the coordination and connection of the service to the
 30 superordinate transport supply; (7) the complete integration of on-demand transport
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 32 all days of the week. The delineation of the service area is an important planning
 33 decision and has an influence on the minimum time between the ordering process

1 and the execution of the journey. Municipal boundaries are less important than the
 2 necessary journey times within the service area and connection points to the
 3 superordinate public transport network. These should therefore not be longer than a
 4 pre-order time of 60 minutes (preferably 30 minutes) allows. The division into
 5 several areas/zones is certainly an option and is used on the W3 shuttle and Walsie
 6 bus. In operation, every effort must be made to ensure that (potential) passengers
 7 have the confidence that their journey request will be fulfilled. This is the only way
 8 to create a regular clientele (also indirectly, by recommending existing users or
 9 multipliers such as accommodation providers for their guests) that can justify
 10 operation in the long term.

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13 **Literature**

14

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