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Attitudes and perceptions towards shared mobility services: Repeated cross-sectional results from a survey among the Maltese population

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Abstract

Shared mobility services, such as (e-)bicycle and car sharing, are a recent introduction in Malta. Following the roll out of these services, the transport regulator (Transport Malta) implemented an information and awareness campaign to promote the use of shared mobility services, and to educate the general public about cycling safety and how to safely share the road. This paper presents the results of a repeated cross-sectional survey with a sample representative of the Maltese population, to understand the awareness and acceptance of these shared mobility services, and analyse the impact of the information and awareness campaign through a comparison of ‘before’ and ‘after’ results.

The ‘before’ results show that the majority of respondents are not aware of bicycle sharing or car sharing. While the second wave of the survey showed an increase in awareness about shared mobility services, wave 3 did not show a continuation of this trend, and evidence for a strong impact of the information and awareness campaign is limited. Respondents consider reduction in traffic and pollution, as well as getting exercise as the main reasons for considering bicycle sharing. For car sharing, respondents view convenience and time savings, as well as financial savings, as the main considerations. Improved road safety and more specifically, segregated and safe infrastructure, investment in cycling skills, and education to promote cycling safety are the main factors identified that have the potential to encourage respondents to consider starting to use bicycle sharing.

The exposure to and understanding of the information and awareness campaign is evaluated through additional questions in the second and third wave of the survey, during and directly following the most intensive part of the campaign. The paper ends with a discussion of the results and recommendations for action in support of further promotion of shared mobility services.

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1. Introduction

Malta, a Mediterranean island state, is the smallest EU member state with a surface area of 316 km². Car ownership and dependence is at an all-time high with 799 cars per 1,000 residents (NSO, 2017) and the modal share of private car use is 74.6% (Transport Malta, 2011). Car dependence has led to congestion and parking issues, deteriorating air quality, noise pollution, and accessibility problems for active transport users. The introduction of shared mobility services, such as (e-)bicycle sharing, car sharing and scooter sharing, are put forward as a potential solution to address the external costs of traffic. The accumulated costs associated with congestion, air and noise pollution, climate change and accidents as a result of private and commercial vehicle use in Malta was calculated to amount to €274 million per year in 2012 (Attard, Von Brockdorff & Bezzina, 2015). Following a business-as-usual scenario, this figure has been projected to increase to €579 million per year by 2025 (Transport Malta, 2016a).

Promoting a modal shift towards more sustainable modes of transport, including public transport, active and shared mobility options, is one of the guiding principles of the National Transport Strategy 2050 (Transport Malta, 2016b). As part of a set of measures proposed for the short term, up until 2025, Transport Malta put forward the idea of introducing car and bicycle sharing services in their Transport Master Plan. Bicycle sharing is proposed as an alternative means of travelling in busy central areas, which can help in normalising cycling for locals and tourists alike, whereas car sharing is expected to improve the efficiency of vehicle use, by sharing a fleet of cars instead of relying on private vehicles (Transport Malta, 2016a). During the past years, a number of shared mobility services, including bicycle, car and scooter (moto) sharing, have been introduced in Malta. Figure 1 presents the geographical spread of the locations served by these shared mobility services.

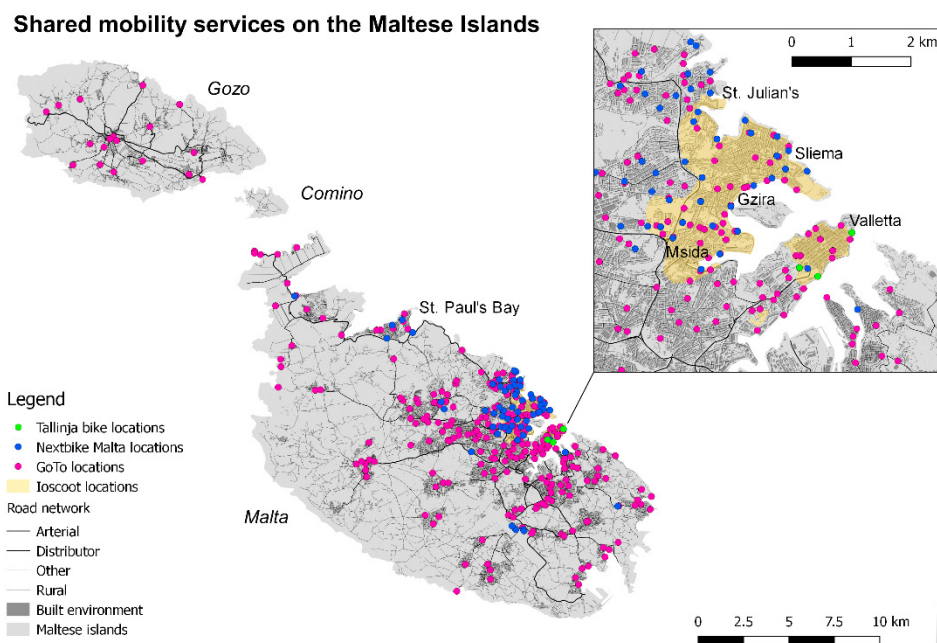


Fig. 1. Shared mobility services on the Maltese Islands (situation April 2019)

Nextbike Malta introduced a bicycle sharing system in late 2016, with 58 stations and over 400 bicycles. The majority of the stations are located around the central urban area stretching from the capital Valletta to the tourist area of St. Julian's, and includes the University of Malta in Msida and residential, commercial and employment centres in Gzira and Sliema. Pricing is €1.50 for the first half hour, and €1 for every consecutive half hour for pay-as-you-go users, in addition to weekly (€15), monthly (€25), quarterly (€35) and yearly (€80) memberships, which include a free first half hour ride. A small group of stations in St. Paul's Bay is served not only by standard bicycles, but also offers electric bicycles available for rent at a higher pay-as-you-go rate (€ 3 for first half hour, €2 for every consecutive half

hour). *Tallinja Bike*, an initiative by bus operator *Malta Public Transport*, inaugurated a small e-bicycle sharing system in Valletta in summer 2018, consisting of 40 electric bicycles spread across three stations in the city; at the central bus station, the ferry landing site in the Grand Harbour, and Fort St. Elmo at the far tip of the city, with a further two stations foreseen in the central square and at the ferry landing site at the Marsamxett harbour side. Pay-as-you-go rates are €3 for first half hour, €2 for every consecutive half hour. In autumn 2018, car sharing company *Car2Go* rolled out their nationwide car sharing service *GoTo*, following a request for proposals by Transport Malta for the provision of a nation-wide car sharing service. The fleet of 150 electric vehicles is available to use across Malta and Gozo, benefitting from over 300 reserved parking spaces. Pay-as-you-go rates are based on a €7/month membership + €0.28/minute, whereas a membership includes 400 minutes for €99/month, with €0.25/minute for any additional use. An electric scooter (moto) sharing service, *Ioscoot Malta*, operated by *Malta Public Transport*, started operations in 2019, with a fleet of 40 electric scooters that can be parked in any motorcycle bay in dedicated areas around Valletta, and the urban centres of Msida, Gżira, Sliema and St. Julian's. Rentals cost €0.25/minute.

2. Literature review

Sustainable mobility policies can be guided by the Avoid-Shift-Improve approach, which provides a hierarchy of priorities (Ang & Marchal, 2013; Jonuschat et al., 2015): firstly, a focus on avoiding the need to make trips, through mixed land use and substituting trips through online communications; secondly, a shift towards more sustainable modes, such as active modes, public transport and shared mobility services; and finally, improved vehicle and fuel technologies. Shared mobility services are positioned in the second step, by shifting the mode of transport to a shared vehicle, which can provide an alternative to private transport, as well as a multi-modal solution for the first- and last-mile leg of journeys made with public transport to be able to reach the final destination (Jonuschat et al., 2015; Shaheen & Chan, 2016). Benefits of shared mobility services occur both for the individual, in terms of increased flexibility and mobility options, money and time-saving, and an increase in physical exercise in the case of bicycle sharing, as well as on a societal level, by reducing congestion, air pollution and carbon emissions, and in the case of bicycle sharing, by providing public health benefits on a population level (Fishman, 2016; Shaheen & Chan, 2016).

Shared mobility services are generally either station-based (with docking stations for bicycles, or reserved car parks for shared cars), or dockless, free-floating systems, where use and parking is flexible within a set perimeter (Fishman, 2016; Shaheen & Chan, 2016). The emergence of smartphones, increased internet access and GPS technology have enabled shared mobility service users with easy ways of accessing information about available vehicles, and a means to securely book, pay for and unlock vehicles (DeMaio, 2009; Shaheen & Chan, 2016). Sharing systems are generally accessible to anyone, with the only limitation being access to a credit card (Beroud & Anaya, 2012), and a driving license in the case of car sharing. Pricing structures are either on a pay-as-you-go basis, with rates per minute or hour, or as part of a membership, ranging from weekly, to monthly and yearly membership types (Shaheen & Chan, 2016).

3. Methods

As part of the CIVITAS DESTINATIONS project, an EU Horizon 2020 project piloting sustainable mobility measures in various Southern European island cities, including the Valletta region (CIVITAS Initiative, 2013), the local transport authority has implemented an information and awareness campaign about shared mobility services, including car sharing, (e-)bicycle sharing, as well as general cycling safety and how to safely share the road. Scooter sharing is not specifically included in the information and awareness campaign, and therefore neither in the survey.

A repeated cross-sectional telephone survey was conducted in three waves to understand people's awareness and acceptance of new shared mobility services, including (e-)bicycle sharing and car sharing, as well as their perception of cycling safety. Although self-reported data may not correspond to the respondent's actual preference, as a result of a number of biases (Wardman, 1988; Bryman, 2016), revealed preference data was not (yet) available, and stated preference surveys were the only measurement tool available to researchers (Efthymiou et al, 2017). The first wave of surveys took place in July and August 2018 (n=362), before the launch of the information and awareness campaign, the second wave in January and February 2019 (n=369), after the launch of the campaign, and the third wave in April 2019 (n=372), directly after the most intense period of the campaign, including information being shared on social media and traditional channels (tv, newspapers, radio).

A stratified random sampling strategy was used to ensure the sample exhibits a proportional representation of population characteristics (Bryman, 2016), by splitting the sample by age, gender and district. A larger than necessary sample was defined to correct for non-response or refusal to participate. To be eligible to participate in the survey, respondents had to be over 18 years of age. An online telephone directory of one of the country's telephony providers was used to source fixed landline telephone numbers. The telephone survey contained five questions relating to the demographic characteristics of the respondents (gender, age, locality of residence, employment status, and level of education), seven questions related to (e-)bicycle sharing; one question related to cycling safety; and six questions related to car sharing. An additional two questions were included in the second and third wave, to understand the impact of the information and awareness campaign. The question on cycling safety contained a number of statements for which responses were recorded using a Likert scale ranging from 1 (highly agree) to 5 (highly disagree) (Bryman, 2016). The data was analysed and descriptive statistics computed using Excel and R.

4. Results

The results are presented according to the different components of the survey: 1) the demographic profile of the survey sample, 2) the awareness and willingness to use shared mobility services, 3) encouraging and discouraging factors, and 4) the impact of the information and awareness campaign.

Table 1 presents the demographic characteristics of the survey samples. The samples are representative of the wider population, the Maltese general public, in terms of gender (49.7% female, 50.3% male, in 2016; NSO, 2018) and age groups (based on 2016 data; NSO, 2018), with a margin of error of 5%.

Table 1. The demographic profile of the survey samples; wave 1 (n=362), wave 2 (n=369), wave 3 (n=372)

Demographic characteristics		Sample specifics			Demographic characteristics		Sample specifics		
		Wave 1	Wave 2	Wave 3			Wave 1	Wave 2	Wave 3
Gender	Female:	53.0%	53.4%	52.2%	Highest education level	No school:	0.3%	0.8%	0.0%
	Male:	47.0%	46.6%	47.8%		Primary level:	10.8%	16.8%	10.5%
						Secondary level:	48.1%	43.6%	63.2%
						Post-secondary level:	19.3%	23.3%	17.5%
						Tertiary level:	21.5%	15.4%	8.9%
Age	18-24:	11.3%	18.9%	10.8%	Employment status	Full-time employed:	44.8%	37.6%	36.8%
	25-34:	16.0%	11.1%	9.9%		Part-time employed:	3.6%	4.8%	7.0%
	35-44:	14.6%	15.4%	20.7%		Housewife/husband:	17.4%	21.9%	16.7%
	45-54:	16.9%	11.1%	17.2%		Retired/pensioner:	27.1%	20.3%	29.0%
	55-65:	18.8%	21.4%	16.7%		Student:	4.1%	14.6%	6.5%
	65+:	22.4%	21.9%	24.7%		Unemployed:	3.0%	0.5%	4.0%

The repeated cross-sectional surveys show mixed results for the awareness about bicycle sharing, as shown in Figure 2(a). The increased in awareness between wave 1 and wave 2 can be potentially explained by the exposure to the awareness and information campaign, as 15% of all respondents indicated to have seen the campaign. However, wave 3 does not continue this trend, and represents the highest percentage of respondents indicating they do not know what bicycle sharing is. There is also no clear trend with regard to the willingness to consider using bicycle sharing, with 19.3% replying positively in wave 1, 8.4% of respondents expressing interest in wave 2, and 11.6% of respondents considering using bicycle sharing in wave 3. However, what can be observed in all three survey waves is that the majority of respondents that do indicate to be interested in using bicycle sharing were under 44 years of age (60% in wave 1, 75% in wave 2, 67% in wave 3). This is consistent with findings in the literature, which show predominant uptake of shared mobility services in the age groups 18-34 years old (Fishman et al., 2015). Up to 40-42% of respondents who expressed interest (in wave 2 and 3) are between 18-24 years, the age when the car driving habit is usually formed in Malta, as most youths start driving lessons as soon as they come of age, thus potentially providing an opportunity to break through this habit formation in this age group. Respondents that indicated being employed (full-time or part-time) or being a student were more likely to consider using bicycle sharing than respondents that are unemployed, retired or a house wife/husband, and the higher the level of education of the

respondent, the more positive the response. The effect of gender on considering using bicycle sharing was not clear, with a more positive response from males in wave 1, the opposite in wave 2, and equal percentages in wave 3.

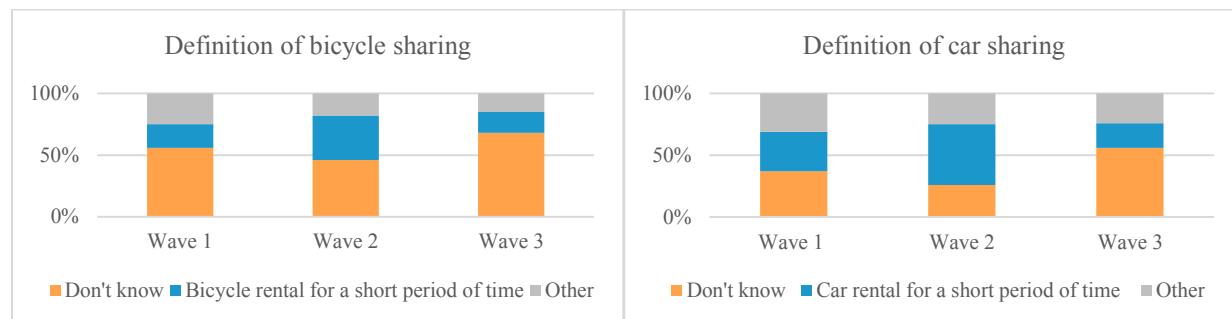


Fig. 2. (a) Definition of bicycle sharing; (b) Definition of car sharing; answers from survey wave 1 (n=362), 2 (n=369), and 3 (n=372)

There is an increase in the number of respondents who have used shared bicycles (locally and/or abroad), from 4.4% in wave 1, to 5.6% in wave 2, up to 14.5% in wave 3. The main reasons for considering using bicycle sharing were ‘less traffic’, ‘for exercise’ and ‘less pollution’ in both wave 1 and wave 3. In wave 2, ‘time savings’ and ‘money savings’ were also mentioned by respondents. All the above reasons for considering using bicycle sharing are in line with individual and societal benefits identified in other bicycle sharing research (Ricci, 2015; Fishman, 2016).

The main reason given for not considering using bicycle sharing is not knowing how to ride a bicycle: 34% of respondents who did not consider using bicycle sharing in wave 1 (n=292), 46% in wave 2 (n=338) and 49% in wave 3 (n=331). However, a large majority of those who cannot cycle are over 45 years old (72% in wave 1; 74% in wave 2, 68% in wave 3). Another prominent reason for not considering using a shared bicycle (33% in wave 1; 30% in wave 2; 20% in wave 3), are family commitments, such as having to take children or other family members around. The impracticality or inability to use a bicycle to run daily errands has been identified as a barrier for cycling (Heinen et al., 2010), although solutions to address these challenges do exist, for example bicycle adaptations (e.g. child seats, cargo bicycles) and home delivery services to avoid having to carry large goods or shopping on a bicycle.

The survey results also show a mixed picture about respondents’ awareness about car sharing: whereas during wave 1 32% of respondents were able to correctly define car sharing, this figure increased to 48% during wave 2, but then decreased to only 20% in wave 3, as shown in Figure 2(b). The car sharing service is still a very recent introduction: during wave 1 the service had just been announced in the media but was not yet operational. During wave 2 of the survey the service had been in operation for just a couple of months, and was still being rolled out, which may explain why none of the respondents had as of yet used the service. A few months later however, the results from wave 3 however show that 18% of respondents have used a car sharing service, either locally or abroad. Despite this, overall the willingness to consider using car sharing decreased between the three survey waves, from 45% of respondents in wave 1, to 22% in wave 2, to 16% in wave 3. There was no significant influence of the age, gender, or employment status of the respondents on their willingness to use car sharing or not. Education level did have a significant influence, with those with higher education levels more likely to consider using car sharing. The main reasons given for not considering car sharing (wave 1, n=200; wave 2, n=288; wave 3, n=312) are ‘prefer to use private car’ (54% in wave 1; 50% in wave 2; 34% in wave 3) and ‘do not drive’ (30% in wave 1; 35% in wave 2; 36% in wave 3). Two main reasons given for considering car sharing by respondents who expressed interest (wave 1, n=162; wave 2, n=81; wave 3, n=60), which were consistent across all three survey waves: ‘convenience’ (51% in wave 1; 60% in wave 2; 65% in wave 3) and ‘time savings’ (44% in wave 1; 33% in wave 2; 35% in wave 3). Respondents are less convinced about the prospects of ‘money savings’, whereas in wave 1 30% of respondents put forward financial savings as a reason for considering car sharing, in wave 2 and 3 this was only the case for 11-12% of respondents.

The main factor that would, consistently across the survey waves, encourage those not currently considering using bicycle sharing was increased safety for cyclists: 28% in wave 1 (n=292), 48% in wave 2 (n=338), and 22% in wave 3 (n=329). The importance of safety is also evident from the responses to the statements included to elicit the perceptions about cycling in Malta. The majority of respondents in wave 1 and 2, and to a lesser extent in wave 3, disagree (1 = highly agree, 5 = highly disagree) with the statements “Cycling in Malta and Gozo is very safe” (wave

1, mean 4.6; wave 2, mean 4.1; wave 3, mean 3.2) and “Bicycle lanes are sufficient and safe” (wave 1, mean 4.5; wave 2, mean 4.0; wave 3, mean 3.2). Factors that would encourage those respondents in wave 1 who do not currently consider using car sharing (n=200) were ‘provision of priority lanes and reserved parking’ (12% in wave 1; 35% in wave 3), ‘free use of service’ (12% in wave 1; 29% in wave 2 and 3) and ‘financial savings (on fuel, maintenance, etc.)’ (9% in wave 1; 15% in wave 2; 21% in wave 3), apart from a large number of respondents (30% in wave 1; 21% in wave 2) who indicated ‘nothing’ would make them consider using car sharing.

The respondents do not seem convinced about the potential cost savings of car sharing. As part of the awareness and information campaign, Transport Malta commissioned a study of the costs associated with private vehicle use, to be able to compare the costs of owning a private car and using a shared car. Figure 3 presents the results of the comparison of the average yearly cost over 10 years for different types of private vehicles (different sizes, new vs. second-hand, and petrol vs. diesel), based on the report ‘Cost of Vehicle Ownership’ (von Brockdorff & Camilleri, 2017), and the pricing structure of GoTo shared cars, based on their pay-as-you-go and subscription rates. The costs are based on the Maltese average of 260 hours of commuting by car per year, as presented in Attard et al. (2015). The costs of private vehicle ownership include costs associated with private vehicle ownership, such as purchasing costs and depreciation, parking costs, and running costs, related to fuel, maintenance, licensing, fines, insurance and cleaning (von Brockdorff & Camilleri, 2017). The GoTo shared car prices include all costs associated with the use of the car, including battery charge, insurance, road licence, waived CVA (Controlled Vehicular Access) fees to enter the capital city Valletta and parking fees (Car Sharing Services Malta Ltd., 2019). The calculated private vehicle costs do not include CVA fees, and nor was the value of time, and costs incurred due to loss of productive and leisure time, included in the calculations (von Brockdorff & Camilleri, 2017). While the report states that the effect of time would be neutral when comparing private and shared vehicles, some time savings can be expected from the use of a shared car versus the use of a private (petrol or diesel) car, seeing as electric cars have the right to use shared bus lanes, and shared cars have a reserved parking space, thus reducing the time spent looking for parking upon arrival at a destination. The competitive advantage of the shared car use is thus actually greater than as presented here, due to savings on CVA fees (where relevant) and time savings as a result of reserved parking and the use of priority lanes.

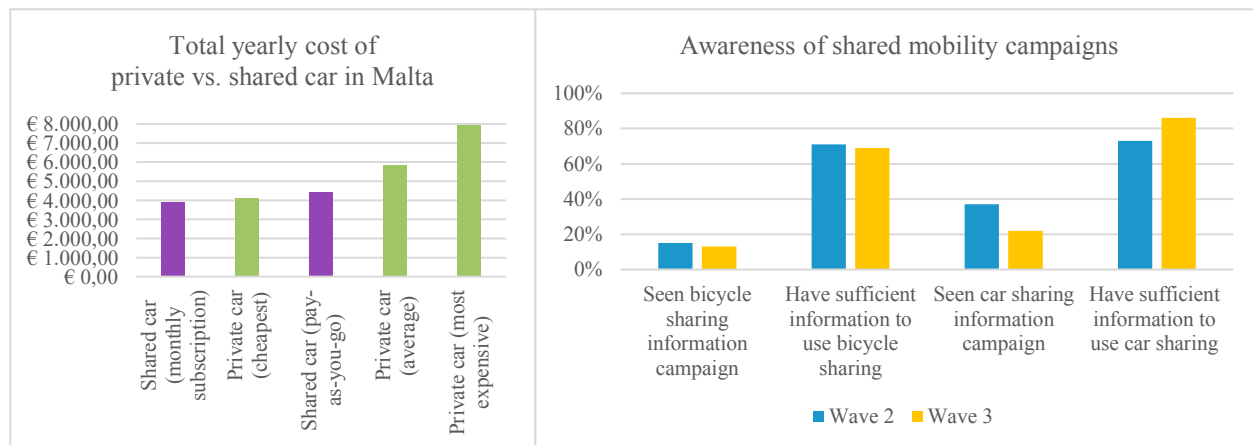


Fig. 3. Comparison of the yearly costs of private versus shared car use in Malta

Fig. 4. Awareness of shared mobility information campaign; wave 2 (n=369), wave 3 (n=372)

Figure 4 shows the results of the impact of the awareness and information about shared mobility services. Whereas the majority of respondents indicates not to have seen the ongoing information campaign about bicycle sharing, and car sharing, a large majority of those who have seen the campaigns feel the information is sufficient to confidently use the service. These results indicate that while the reach and penetration of the campaign may not have (yet) reached its full potential, those who have seen the campaign are generally well informed by the information provided.

5. Discussion

While it appears that the information and awareness campaign has had some success in communicating the idea behind bicycle sharing, and a larger percentage of respondents has used shared bicycles, this does not automatically translate into an increased willingness to use the service. Results from the three waves of surveys show that the predominant barrier for taking up the use of bicycle sharing is respondents' concerns about road safety, which negatively affects their willingness to consider the use of bicycles. This is in line with findings from Drama in Greece, where respondents were asked about their willingness to use a proposed bicycle sharing system, and their reasons for (not) cycling (Nikitas, 2018). 'Lack of adequate cycling infrastructure' and 'limited road safety' were reported by 49.1% and 43.6% of respondents respectively when asked why they do not consider cycling. The creation of dedicated cycling infrastructure on arterial roads, reduction of speed limits on residential and rural roads, and awareness raising among all road users are proven strategies to improve road safety for cyclists (Heinen et al., 2010; Handy et al., 2014). Experiences from Seville (Spain), where in recent years a 120 km bicycle network has been created, and a successful bicycle sharing scheme that was introduced in 2007, show a seven-fold increase in daily cycling trips, from around 10.000 trips per day in 2006 to over 70.000 trips per day in 2011 (Marqués et al., 2015). To address the relatively high percentage of people indicating not knowing how to cycle, (34-49% of respondents in Malta, versus for example 4.7% of respondents in Drama (Greece); Nikitas, 2018), cycling promotion and education can take place from a young age, through bicycle training and cycling lessons and the creation of safe routes to school, as well as for those who wish to learn how to ride a bicycle later in life, through cycling lessons for all ages (Pucher et al., 2010; Handy et al., 2014), such as being offered by Nextbike Malta through their free Bikeability course.

In order to truly promote modal shift, it is not only important that there are viable alternatives available, as being proposed by the discussed shared mobility services, but also that there are restrictions on private car use, both in physical terms (e.g. access or parking restrictions) and financial terms (e.g. increased parking fees, congestion charges). Any increase in time, cost or effort results in a decreased probability that a transport mode will be chosen (Heinen et al., 2010). The survey results show that respondents are interested in car sharing for reasons of 'convenience' and 'time savings'. Extending the road space allocated for shared mobility modes, for example for shared and clean vehicles (e.g. the extension of the network of shared priority lanes), can increase the competitive advantage of shared modes over the current dominant mode of transport by private car. Further marketing may be necessary to explain and communicate the true costs of owning and driving a private car versus a shared car, especially at key moments when people decide to purchase a car, e.g. when coming of age or following lifestyle changes.

While telephone surveys are a quick and cost-effective way to conduct surveys across a country's population, there are also some limitations associated with using fixed telephone number only (Bryman, 2016). Although the survey samples are representative of the population in terms of age groups, there is still a risk that the more technology-savvy younger generations (those who rely on mobile phones rather than fixed telephony), and especially the increasing number of foreign (temporary) workers in the IT sector, both key target groups of shared mobility services, are underrepresented in the samples. Using a mobile phone registry, as utilised by Therrien et al. (2014), could have ensured a more varied population to sample from. In addition, because of the geographic limitations of the bicycle sharing system, focused on a few centrally located localities, a large share of the respondents does not necessarily live or work within the catchment area of the bicycle sharing system, as the survey sample is from all over Malta and Gozo. Future research and marketing campaigns could focus more specifically on target groups expected to take up shared mobility services, based on characteristics such as age and locality of residence.

6. Conclusions

This paper discussed the implementation of shared car and bicycle mobility services in Malta through the results of repeated cross-sectional surveys to understand the Maltese population's awareness of and attitudes towards these shared mobility services, as well as the impact of a dedicated information and awareness campaign by the national transport regulator. In terms of awareness of what bicycle sharing and car sharing mean, the survey results show a mixed picture. Wave 2 showed an increased awareness in relation to wave 1, but wave 3 did not follow through this trend. There is also no clear trend in willingness to use shared mobility services. However, for bicycle sharing a strong representation of younger age groups among those who are interested, indicates that future campaigns or marketing

could target the 18-44 age category more specifically, and especially the 18-24 cohort, before the formation of the private car use habit. The reach and penetration of the campaign may not have (yet) reached its full potential, with only 13-15% of the sample having noticed the awareness campaign about bicycle sharing, and between 22-37% about car sharing, but those who have seen the campaign are generally well informed by the information provided, as indicated by a large majority (ranging from 70-85% of respondents who had seen the campaign).

Further information provision about shared mobility services, specifically targeting certain localities or age groups, to educate more people about these services, and to communicate the advantages of the use of shared bicycles or cars over private car transport. The comparison of costs associated with private and shared car use, and the competitive advantage of shared car use in terms of lower costs, reserved parking and use of priority lanes directly match the respondents' main encouraging factors for shared car use. To encourage the use of shared bicycles, and cycling as a mode of transport in general, respondents' clearly indicate the need for safer conditions for cycling, through the creation of dedicated infrastructure and awareness raising about road safety for all road users. The large percentage of the population that does not know how to cycle warrants investment in cycling education for all ages.

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