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Attitudes and perceptions towards the introduction of shared mobility services in Malta

Suzanne Maas^{a*}, Maria Attard^a

^a *Institute for Climate Change and Sustainable Development, University of Malta, Msida MSD2080, Malta*

Abstract

Shared mobility services, such as bicycle and car sharing, are a recent introduction in Malta. In order to understand the awareness and acceptance of these shared mobility services, a telephone survey was conducted with 362 respondents, representative of the general Maltese population. The results show that the majority of respondents are not aware of bicycle sharing or car sharing and that even among those who are aware of these shared mobility services, there is still confusion about the exact meaning of the concepts. Respondents consider reduction in traffic and pollution and an increase in their levels of exercise as the main reasons for bicycle sharing. For car sharing, respondents view convenience and savings of time and money as the main considerations. Reasons given for not considering the use of shared mobility services are a preference to continue using private modes of transport, not knowing how to cycle or drive, or constraints brought about by family commitments. Improved road safety and more specifically, segregated and safe infrastructure and education to promote cycling safety, are the main factors identified that have the potential to encourage at least a quarter of respondents to consider starting to use bicycle sharing. The paper ends with recommendations for action in support of shared mobility services.

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1. Introduction

Malta comprises of three main islands, Malta, Gozo and Comino, and has a total surface area of 316 km² (NSO, 2017). As a small island state, Malta has one of the highest population densities and per capita car ownership rates in the European Union (Attard, 2005). In 2015, the total population of the country was 450,415 (NSO, 2018), while car ownership amounted to 799 cars per 1,000 residents (NSO, 2017). The modal share of private car use (drivers and passengers) grew from 54.7% in 1989 to 74.6% in 2010 (Transport Malta, 2011).

* Corresponding author. Tel.: +356-23403739. E-mail address: suzanne.maas@um.edu.mt.

Car dependence is leading to a number of serious transport problems such as congestion, longer journey times and parking challenges, which in turn contribute to aggravating environmental and social issues, related to air pollution, climate change and public health (Transport Malta, 2016a). In a special Eurobarometer survey on attitudes of Europeans towards urban mobility, Maltese citizens were the most likely of all respondents in Member States to highlight road congestion (97%), air pollution (95%) and noise pollution (92%) as important challenges (European Commission, 2013). However, due to Malta's small size and highly urbanized morphology, it may be more sensible to compare such statistics with other major cities, rather than with other European countries (Transport Malta, 2011). In their study of the external costs of private and commercial vehicle use in Malta, Attard, Von Brockdorff & Bezzina (2015) found that the total costs associated with accidents, air pollution, climate change, noise and congestion amounted to €274 million in 2012, a figure that has been projected to rise to €579 million per year by 2025 following a business-as-usual scenario (Transport Malta, 2016a). More efficient use of the road network and the promotion of soft mobility modes (including cycling) formed part of the recommendations under the preferred policy scenario to bring down the external costs of traffic and congestion (Attard et al., 2015). In their Transport Master Plan for 2025, Transport Malta (2016a) also highlight the need for a modal shift to alternative modes and better integration between different transport modes.

2. Literature review

Shared mobility, a growing sector within the sharing economy, is generally understood to refer to both the sharing of a vehicle and the sharing of rides (Shaheen & Chan, 2016). In this paper, the focus is on the use of shared vehicles: public bicycles, scooters and cars (amongst others), known as bicycle sharing, scooter sharing, and car sharing services, excluding ride-sharing and on-demand ride services from the discussion. Shared bicycles, scooters and cars enable short-term as-needed access to mobility (Shaheen & Chan, 2016), and can provide flexible, one-way and first- or last-mile mobility solutions (DeMaio, 2009; Shaheen et al., 2009; Shaheen et al., 2010). The widespread uptake of smartphones, combined with GPS positioning technology, increased internet coverage, and the use of social networks has enabled people to connect, share and exchange information in new and easier ways, and has enabled the growth of shared mobility services (DeMaio, 2009; Shaheen & Chan, 2016).

Car sharing currently takes different forms, either in a fixed, station-based car sharing system, where the car is checked-out and checked-in at the same location; in a flexible, free-floating system, a one-way car sharing system in which you can book a car through an app from any location within a certain area; and through peer-to-peer sharing, whereby private individuals can rent a car from another private individual through transaction on an online platform (Jonuschat et al., 2015). Bicycle sharing systems can be broadly classified in two different categories: those based on docking stations, where users can rent and return the bicycles (most often at any available station, but in some cases bicycles have to be returned to the same station), and dockless free-floating systems, where users can find, rent and return a bicycle through an app within a defined area (DeMaio, 2009; Fishman, 2016). Some car and bicycle sharing providers are now also providing additional transport options, such as shared scooters, as well as electric vehicles and bicycles (Shaheen & Chan, 2016).

Benefits of shared mobility services over private vehicles exist on different levels, for the individual, the transport operator and/or authority, and society as a whole (Shaheen et al., 2010). For users, shared mobility can offer on-demand, flexible and increased mobility options, travel time and cost savings, and in the case of bicycle sharing, health benefits from increased physical activity (Shaheen et al., 2010; Ricci, 2015). From the operator or local transport authority's perspective, shared mobility systems can provide a more efficient and low-cost alternative to investing in infrastructure for private vehicles or increased capacity for public transport (Shaheen et al., 2010; Castillo-Manzano et al., 2015). For society as a whole, benefits range from reduced congestion and improved environmental quality (reductions in air pollution and carbon emissions) as a result of mode shift and reduced private vehicle ownership (Martin & Shaheen, 2011; Shaheen & Chan, 2016), to public health improvements, in the case of bicycle sharing, as a result of increased physical activity at population level (Woodcock et al., 2014; Fishman, 2016).

Although the actual greenhouse gas emission reductions of shared mobility services have not always been as substantial as promised or promoted (Médard de Chardon et al., 2017), the consensus is that these services can contribute to emission reductions by shifting mobility away from private fossil-fuel based car use (Martin & Shaheen, 2011; Fishman et al., 2014). While in select cases carbon emissions have been estimated to have increased as a result

of the bicycle sharing system, because of emissions caused by the vans used for rebalancing the bicycles and limited modal shift from car to bicycle (e.g. in London; see Fishman, 2016), evidence from a number of cities in North America, Australia and Europe shows that in general, cities with higher car modal share show a higher rate of mode substitution of bicycle sharing trips for journeys previously made by private car, and thus contribute to net emission reductions (Shaheen et al., 2012; Fishman et al., 2015).

Shared mobility has the potential to offer improved mobility and accessibility to those with limited financial means, as it reduces the need to cover costs related to the purchase, insurance, maintenance, and fuel (in the case of a car or scooter), which come with owning a private vehicle. Initial evidence from the use of car sharing and bicycle sharing systems indicates that there is an uneven distribution among socio-demographic groups (Martin & Shaheen, 2011; Ricci, 2015), and that the user base is skewed towards a younger, middle class demographic with above average education level for both types of shared mobility services (Martin and Shaheen, 2011; Clark and Curl, 2016), and specifically skewed towards males in the case of bicycle sharing systems (Ogilvie and Goodman, 2012; Clark and Curl, 2016; Fishman, 2016). However, the observed inequality may be partially explained by geographical disparity of many shared mobility services: most services are concentrated around commercial city centres and business districts, and evidence from shared mobility services around the world shows that distance to sharing station or rental location is an important determinant for use of the service (Efthymiou et al., 2013; Fishman, 2016). Because of their geographic limitations, shared mobility services serve only a small section of a city's population, e.g. only 10-15% of the total population in the case of Glasgow (Clark and Curl, 2016), therewith often not effectively serving other, and especially less affluent, parts of the city. Evidence from the London bicycle sharing system has shown that when adjusting for distance to the nearest bicycle sharing station, residents of more deprived neighbourhoods actually make more trips per month than those from wealthier areas (Ogilvie and Goodman, 2012), and the expansion of the London bicycle sharing system eastward into more deprived areas demonstrated an increase in shared bicycle use by residents of these parts of the city (Goodman and Cheshire, 2014), indicating that providing good accessibility to the shared mobility system, while ensuring affordability, can enable equal opportunities and improved mobility for everyone.

3. Shared mobility in Malta

The Transport Master Plan 2025 identifies the need for cleaner, safer and smarter transport in the Maltese Islands (Transport Malta, 2016a). Shared mobility is proposed as a potential contributor to meeting these goals in the plan. Car sharing is presented as a shared fleet of vehicles that could improve efficiency in the use of vehicles and benefit from parking priority within parking management schemes, while bicycle sharing schemes are said to have the potential to offer locals an alternative means of travelling in busy central areas, as well as offer a new mode for tourists to visit attractions around Malta, and can help to normalise the image of cycling, showing that it is not “risky” or “only for sporty people” (Transport Malta, 2016a).

In the past two years, a number of shared mobility operators have been introduced in Malta, offering shared bicycle, car and scooter services (see Figure 1 for the locations and distribution of the shared mobility services as of November 2018).

Bicycle sharing system operator *nextbike Malta* started operations in December 2016 (Leone Ganado, 2016). As of November 2018, the system consists of 54 stations, the majority of which are distributed around Malta's main conurbation including Sliema and St. Julian's, as well as in a few more isolated locations, such as a single station in Valletta, and in small clusters of stations, for example in the St. Paul's Bay area (4 stations). The system has around 400 bicycles in operation, of which a small number (<10) are electric bicycles for rent from the cluster of stations in the St. Paul's Bay area. Registration is required to rent a bicycle, after which the bicycles can be rented through an app or by phone through an automated system. The fee structure (based on standard bicycles, higher pay-as-you-go fees apply for e-bikes) is split between memberships and a pay-as-you-go rate. Membership fees are €80 for a yearly, €35 for a quarterly, €25 for a monthly, and €15 for a weekly membership, which allows members unlimited free 30 minute rides and reduced rates for longer trips. Casual users pay €1.50 for the first 30 minutes, and €1 for every consecutive half hour on a pay-as-you-go basis (nextbike Malta, 2018).

In August 2018, the local bus operator Malta Public Transport introduced an e-bicycle sharing system for the city of Valletta: *Tallinja bike*. The system started operations with three stations, one at the main bus terminus, one at the Grand Harbour ferry landing (Valletta – Three Cities ferry) and one at Fort St. Elmo, with 40 electric bicycles in

operation (Malta Public Transport, 2018). A further two stations, one at the Marsamxett ferry landing (Valletta – Sliema ferry) and one at the main square in the city centre are planned (Leone Ganado, 2018). Users can register at the kiosk at the bicycle sharing stations, and can thereafter rent bicycles from the kiosks using their personal ID and a pin code. The fee is either paid on a casual pay per use basis, €3.00 for the first 30 minutes, and €2 for every consecutive half hour, or at a reduced price for registered *Tallinja* smart card users (which can already be used on all Malta Public Transport bus services and Valletta Ferry Services), and for tourists using the *Tallinja Explore* smart card and *Valletta* card (Malta Public Transport, 2018).

Following a request for proposals for the provision of a nation-wide car sharing service by Transport Malta in 2016, to serve all localities on Malta and Gozo (Transport Malta, 2016b), the company Car2Go won the concession contract to start operations with their *GoTo* car sharing service. In autumn 2018, *GoTo* rolled out their marketing campaign and announced their fleet of 150 electric cars, supported by 225 charging pillars and 450 reserved parking spaces, covering all Maltese localities, would be “coming soon” (Car Sharing Services Malta Ltd., 2018). At the time of writing (November 2018), 229 reserved parking spaces have been created (see Figure 1), but it is planned that every locality on Malta and Gozo will have access to the car sharing service. Users have to register and can locate and reserve a car through an app. Pricing is either on a pay-as-you-go basis, consisting of a €7 monthly membership and an additional €0.28/minute, which covers all fuel, insurance, and parking and access fees, or else through a package deal, which is priced at €99 per month and offers 400 free minutes per month and €0.25/minute when exceeding that amount, again including all fees (Car Sharing Services Malta Ltd., 2018).

In July 2018, *ioscoot* announced the introduction of their electric scooter sharing service. Registration for the service is required, and at the time of writing (November 2018) the website indicates that the initial registration period for the trial period is now closed. Registered users will be able to locate and rent the scooters through an app. The scooter sharing service will start with 40 electric scooters, which will be available for pick-up and drop-off at any location within designated areas around Valletta, Msida, Gzira, Sliema and St. Julian’s. Information about pricing was not provided at the time of writing, but there is mention of integration with the *Tallinja* public transport smart card, which will offer a discounted price (ioscoot Malta, 2018).

Shared mobility services on the Maltese Islands

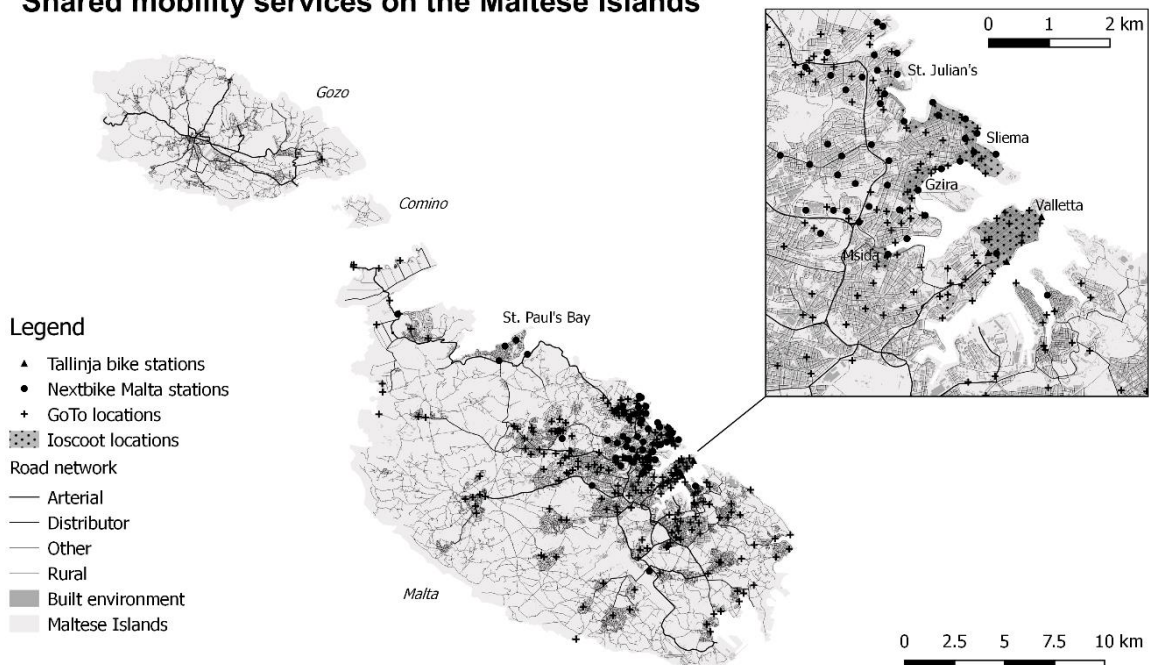


Fig. 1. Shared mobility services on the Maltese Islands.

4. Methodology

The research was commissioned by Transport Malta, the local transport authority, as part of the CIVITAS DESTINATIONS project, which is testing out and evaluating sustainable mobility measures in a number of Southern European island cities, including the conurbation around Valletta in Malta (CIVITAS Initiative, 2013). One of the measures that will be implemented is an information and awareness campaign to promote the use of shared mobility services, including (e-)bicycle sharing and car sharing, and educate the general public about cycling safety and how to safely share the road.

In order to gauge people's awareness and acceptance of recently introduced and planned shared mobility services, (e-)bicycle sharing and car sharing, as well as their perception of cycling safety, a telephone survey was conducted in July and August 2018 (n=362). Respondents had to be over 18 years of age to participate. A stratified random sampling strategy was used, splitting the sample by age, gender and district. This ensures that the sample exhibits a proportional representation of the different population characteristics (Bryman, 2016), and is therefore representative of the general population with respect to those characteristics. Fixed landline telephone numbers were sourced from an online telephone directory from one of the main national telephony providers. A larger sample than required was extracted to compensate for non-response or refusal to participate.

The telephone survey contained four separate sections with 19 questions in total: 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. 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.

5. Results

The results are presented according to the four different parts of the survey: 1) general demographic characteristics of the survey sample, 2) attitudes and perceptions towards (e-)bicycle sharing, 3) perceptions of cycling safety, and 4) attitudes and perceptions towards car sharing.

Table 1. The demographic profile of the survey sample (n=362).

Demographic characteristics	Sample specifics
Gender	Female: 53.0%
	Male: 47.0%
Age	18-24: 11.3%
	25-34: 16.0%
	35-44: 14.6%
	45-54: 16.9%
	55-65: 18.8%
	65+: 22.4%
Employment status	Full-time employed: 44.8%
	Part-time employed: 3.6%
	Housewife/husband: 17.4%
	Retired/pensioner: 27.1%
	Student: 4.1%
Highest education level	Unemployed: 3.0%
	No school: 0.3%
	Primary level: 10.8%
	Secondary level: 48.1%
	Post-secondary level: 19.3%
	Tertiary level: 21.5%

5.1. Demographic characteristics

Table 1 represents the demographic characteristics of the survey sample. The sample is 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), at a 95% confidence level.

5.2. Attitudes and perceptions towards bicycle and e-bicycle sharing

Just over 55% (n=201) of all respondents indicated that they did not know what the term bicycle sharing means. Only 19.3% correctly explain the term as ‘bicycle rental for a short period of time’. The remaining answers were from respondents who indicated they had heard the term bicycle sharing, but when asked to define the term, gave an incorrect explanation, i.e. ‘sharing a personal bicycle with others’, or ‘contributing towards a family bicycle’.

Those respondents who had heard about bicycle sharing (n=161) were asked if they were aware of the difference between bicycle sharing and e-bicycle sharing, to which 88.8% answered they did not know the difference. Only 11.2% replied positively, and of these, the majority correctly explained that e-bicycle sharing refers to the bicycles being electric, whereas the other respondents provided an incorrect explanation for the term e-bicycle, i.e. ‘buying or renting a bicycle online’, ‘renting a bicycle through an app’, or referring to a ‘bicycle with a (fuel-based) motor’. Table 2 shows the answers provided for the respective questions and follow-up questions.

Table 2. Respondents’ understanding of (e-)bicycle sharing.

“What do you understand by bicycle sharing?” (n=362)			
‘Don’t know’	55.5%	} “Do you know the difference between bicycle and e-bicycle sharing?” (n=161)	
‘Bicycle rental for a short period of time’	19.3%		
‘Sharing a personal bicycle with others’	19.1%		
‘Contributing towards a family bicycle’	6.1%		
			} “Can you explain the difference? E-bicycle means ...” (n=18)
‘No’	88.8%		
‘Yes’	11.2%		
			‘The bicycle is electric’ 61.1%
			‘Buying or renting a bicycle online’ 22.2%
			‘Renting a bicycle through an app’ 11.1%
			‘The bicycle has a motor (fuel-based)’ 5.6%

Only 4.4% (n=16) of all respondents indicated to have ever used a shared bicycle. Half of these respondents have used bicycle sharing in Malta, whereas the other half indicated having used a bicycle sharing system abroad. The majority of those who have used bicycle sharing (10 out of 16) fall within the age group 18-34, which has been identified in the literature as the main user group of bicycle sharing systems in different contexts worldwide, e.g. in Dublin (Murphy & Usher, 2015), Melbourne and Brisbane (Fishman et al., 2015), and Montréal (Fuller et al., 2011). Of all the respondents, 19.3% (n=70) indicate they would consider using a shared bicycle. As can be seen in Figure 2, more than half of those respondents that indicate that they would be willing to use the bicycle sharing system are between 18 and 34 years ago, again consistent with previously mentioned findings in the literature.

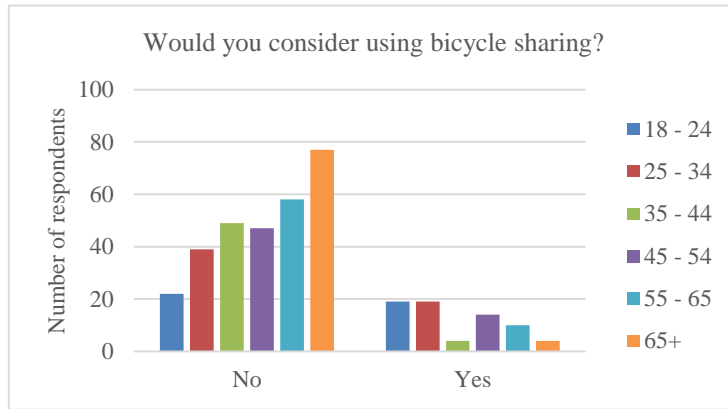


Fig. 2. Attitude towards bicycle sharing, by age group.

When asked to motivate their choice, respondents mainly answered they would consider using bicycle sharing because of ‘less traffic’, ‘for exercise’ and ‘less pollution’ (see Figure 3a), responding to perceived local transport and environmental issues, as well as personal health benefits, in line with the benefits identified by users of shared bicycles in Seville, Spain (Castillo-Manzano & Sánchez-Braza, 2013), in Chattanooga, USA (Webster & Cunningham, 2013), and León, Mexico (Gámez-Pérez et al., 2017). Respondents appear less convinced that using bicycle sharing might save them money or time, or be a convenient alternative mode of transport, which have in actual fact been identified as the main factors driving shared bicycle use (Ricci, 2015; Fishman, 2016).

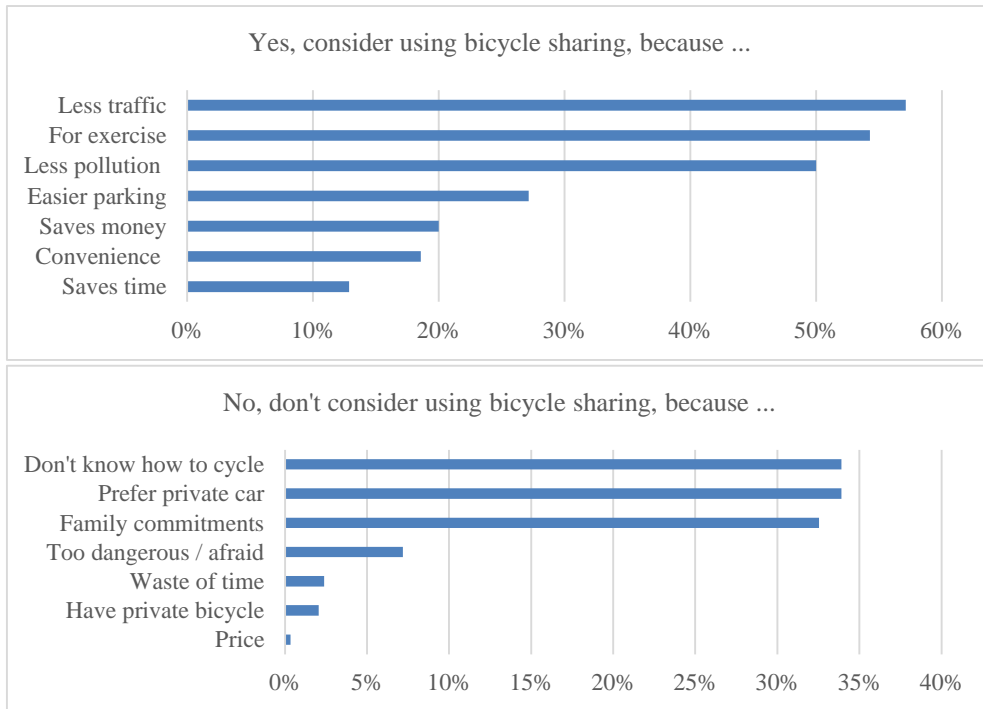


Fig.3. (a) Reasons for considering using bicycle sharing (n=70, multiple answers possible); (b) Reasons for not considering using bicycle sharing (n=292, multiple answers possible).

Those who answered they do not consider using bicycle sharing (n=292), indicated the following main reasons (see Figure 3b): ‘not knowing how to cycle’, ‘prefer using private car’ and ‘impossible because of family commitments’, referring to being responsible for taking young or elderly family members around, and not considering being able to meet those obligations by using a shared bicycle. These barriers are in line with those identified in other cycling research, e.g. the perceived inability to carry shopping or pick up children by bicycle (Heinen et al., 2010), and perceiving cycling as impractical, but also lacking the skills to cycle and an inability to picture oneself as a cyclist (Willis et al., 2014). Interestingly, Heinen et al. (2010) found that people who do not cycle perceive more barriers to utilitarian cycling than people who cycle already, indicating that there is a certain misconception of the advantages and disadvantages of cycling.

Those respondents that indicated they do not presently consider using bicycle sharing (n=292) were asked what factors would encourage them to start considering using bicycle sharing. Respondents were allowed to select multiple answers, as a combination of encouraging factors is possible, and were also asked if there were any other encouraging factors that played a role for them, at the end of the question. ‘Increased safety to cyclists’ (28.4%) and ‘better road reconfiguration’ (15.1%), referring to the separation of transport modes and/or the lowering of travel speeds with the aim of improving road safety, were the most frequently mentioned factors that would encourage respondents to consider to start using shared bicycles. Other suggested factors, such as the provision of tax incentives, free use of the service, restrictions to car parking or paid parking for private cars, and provision of P&R facilities and multi-modal transport hubs were only selected by a few respondents (between 3 and 6%).

Moreover, despite the question being positively phrased, that is “What would encourage you to make use of bicycle sharing?”, a large number of respondents provided discouraging factors when asked if there were any other factors relevant for them. 22.3% of respondents indicated that ‘nothing’ would encourage them to use shared bicycles. Apart from this negative response, respondents mentioned other discouraging factors, such as ‘not being able to cycle due to age or health reasons’ (12.3%), and ‘not knowing how to cycle’ (6.8%).

5.3. Perceptions of cycling

Survey participants were asked to respond to a number of statements related to the safety of cycling in Malta. As can be seen from Table 3, most respondents (highly) disagree with the first two statements, related to cycling safety and the provision of safe cycling infrastructure. The majority of respondents agree with the statement that bicycle accidents commonly involve vehicles, and (highly) agree that there should be more awareness on cycling safety and education on sharing the road. The output is less clear for the final two statements about following the rules, which refers to the rules as laid down in the Maltese Highway Code. Both statements garnered a mean on or very near the middle value – neither agree, nor disagree – with a larger variation in responses too, as the standard deviation is larger than for the other statements. This could be partially explained by a certain ambiguity in the statement: respondents will know people who fall in either category, those that follow the rules, and those that do not. In addition, and especially in the case of the statement pertaining to drivers, respondents are likely to be drivers themselves and may not want their response to reflect badly on their own behaviour.

Table 3. Perceptions of cycling in Malta.

Mean response to statements below (1=highly agree; 5 = highly disagree; SD – standard deviation)	
“Cycling in Malta and Gozo is very safe”	4.564 (SD 0.80)
“Bicycle lanes are sufficient and safe”	4.533 (SD 0.75)
“Bicycle accidents commonly involve vehicles”	1.862 (SD 1.03)
“There should be more awareness on cycling safety”	1.494 (SD 0.79)
“All road users should be educated on road sharing”	1.470 (SD 0.78)
“Cyclists do not follow the rules”	2.923 (SD 1.04)
“Drivers do not follow the rules”	3.006 (SD 1.26)

5.4. Attitudes and perceptions towards car sharing

37.0% (n=134) of all respondents indicated that they did not know what the term car sharing means. Nearly a third of all respondent (32.0%, n=116) could correctly explain the term as ‘a type of car rental for a short period of time’. The remaining answers were from respondents who indicated they had heard the term car sharing, but when asked to define the term, gave an incorrect explanation, that is ‘sharing a personal car with others (carpooling)’ (28.7%, n=104), ‘contributing towards a family car’ (1.9%, n=7), or ‘something along the lines of Uber’ (0.3%, n=1). That a difference exists between car sharing and ride sharing (carpooling) is clearly not very evident for a large number of respondents.

At the time of the survey, car sharing was planned and advertised for Malta, but not yet physically available. Therefore, respondents were not asked about their actual use of car sharing, but only whether they consider its use. The response was nearly half and half: 55.2% (n=200) indicated they would not consider using car sharing, whereas 44.8% (n=162) answered that they would consider using the service. As can be seen in Figure 4, the prevalence of not considering car sharing increases with age, whereas those respondents that indicate that they would be willing to use the car sharing system are found more in the younger and middle age categories.

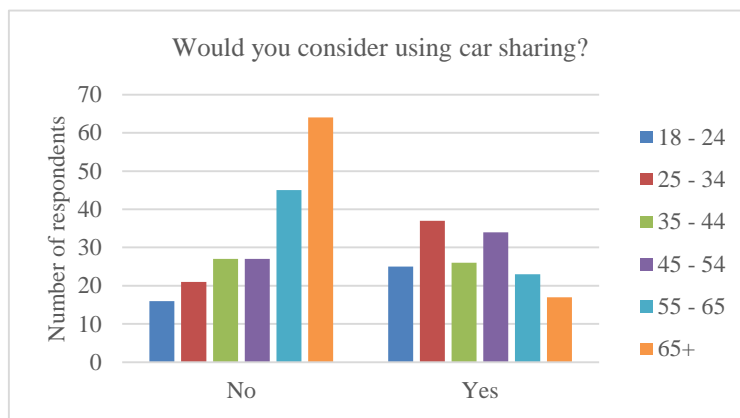


Fig. 4. Attitude towards car sharing, by age group.

When asked to motivate their choice for considering the use of car sharing, respondents’ main reasons were because of ‘convenience’, ‘saving time’ and ‘saving money’ (see Figure 5a). To a lesser extent, respondents consider the use of car sharing in order to contribute to lessening the transport problem and resulting environmental issues. Those who answered they do not consider using car sharing, indicated the following main reasons: ‘prefer using private car’ and ‘do not drive’ and, to a lesser extent, ‘impossible because of family commitments’ (see Figure 5b). Concerns related to time and money are only brought up by a few respondents.

Respondents that indicated they do not presently consider using car sharing (55.2%, n=200) were asked what factors would encourage them to start considering using the service. Similar to the response to the question for encouraging factors for bicycle sharing, the most common response (29.5%) was an unprompted ‘nothing’ (i.e. nothing would convince respondents to start using car sharing), when asked if there were any other factors that would encourage them at the end of the question. Factors that would encourage some respondents to consider using car sharing were ‘provision of priority lanes and reserved parking’ (12.0%), ‘free use of the service’ (11.5%) and ‘financial savings (on fuel, maintenance, etc.)’ (8.5%). Other suggested possible encouraging factors, such as the provision of tax incentives, restrictions to car parking or paid parking for private cars, and provision of P&R facilities and multi-modal transport hubs received were only selected by few respondents (between 2 and 6.5%). 9.0% of respondents in this category answered they did not consider using the service because they do not drive.

When asked which locations respondents (n=362) would suggest for car sharing, only 37% of respondents understood the concept that the car sharing system would be most useful if there are stations all around the island, with 17.1% of respondents suggesting locations ‘everywhere, in every locality’, and 19.9% of respondents suggesting

locations ‘in busy, central areas’ (e.g. near commercial and business centres, busy residential areas, touristic locations). The remainder of the respondents either suggested the capital Valletta (22.7%) or Sliema (21.0%), one of the main commercial areas, or else a wide variety of localities, in most cases their own hometown, or perhaps a locality they frequent for work, education or for visiting family or friends. From the latter it appears a large number of respondents did not yet adequately grasp the concept of car sharing, i.e. that it could enable one-way journeys, from any point A to B, thus requiring varied and spread locations across the country to offer that convenience and flexibility, and for their personal utility, close to their home and work locations.

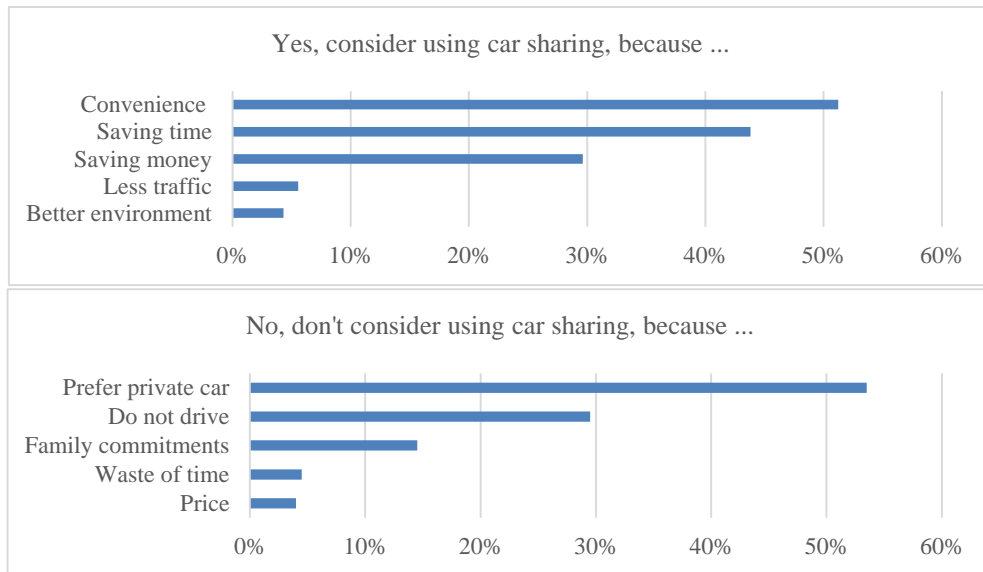


Fig.5. (a) Reasons for considering using car sharing (n=162, multiple answers possible);
(b) Reasons for not considering using car sharing (n=200, multiple answers possible).

6. Discussion

6.1 Limitations of the research

While telephone surveys provide an easy and cost-effective way to reach a large sample across a country, there are some drawbacks to approaching a population through fixed phone lines only (Bryman, 2016). Sampling only from fixed landline telephone numbers, while excluding mobile phones in the sample, may lead to possible selection bias such as over-representation of older people, and under-representation of younger generations (Fuller et al., 2013). In Malta, more and more people are substituting mobile phones for fixed telephony, and 37% of respondents in a recent survey by the Malta Communications Authority, indicated considering terminating their fixed line connection (MCA, 2018), adding to the evidence that fixed line telephone surveys may not be able to reach a fully representative sample of the population. Potentially under-representing younger people, who are more likely to positively view and consider using shared mobility services, could have skewed the results obtained through our research in favour of the views held by older segments of the population. However, the age groups captured in the sample are representative of those in the general Maltese population at a 95% level of confidence, thus adding to the robustness and potential for generalization of our findings to the general population. In the future, another approach might be to use random-digit dialling, or obtain a mobile phone number list from a telephony provider, to ensure a more varied population to sample from, as observed in a similar study by Therrien et al. (2014).

Nonetheless, we expect (temporary) foreign workers to be less likely to be accessed through registered fixed telephony, assuming they are more likely to rent and move more frequently. Most non-Maltese residents live in the Northern Harbour district and the St. Paul's Bay area (NSO, 2014). In the Northern Harbour district, the percentage of non-Maltese in relation to the total population in the locality amounts to 15.4% in Sliema, 14.5% in St. Julian's,

11.4% in Swieqi, 10.7% in Gżira and 9.5% in Msida. In the St. Paul's Bay area (including Bugibba and Qawra), the non-Maltese population is 18.4% of the total population in the locality (figures are for the year of the latest national census in 2011; NSO, 2014). These areas correspond well to the main operating areas of the bicycle sharing system provided by nextbike Malta, and, in the case of the Northern Harbour localities, the target area of the ioscoot electric scooter sharing system. Net migration in 2015 amounted to 4,176 persons, of which 44% were third country nationals, 43% EU nationals, with the remainder being Maltese nationals returning back from abroad (NSO, 2016). In 2018, there were almost 43,000 foreign workers in Malta, of which the majority (~70%) from EU countries (Martin, 2018; Micallef, 2018). Part of the increase in foreign workers is due to an influx of IT professionals in response to the growth in the online gaming sector which in 2015 accounted for 11 per cent of Malta's GDP and employed 8,000 people (The Malta Independent, 2016; Martin, 2018), as well as those employed in related IT and financial services sectors, a subgroup that matches the young, middle class, educated demographic that has been found to be most open to the use of shared mobility services (Martin and Shaheen, 2011; Clark and Curl, 2016). By approaching survey respondents only through fixed telephone lines, it is likely that this group of residents is not sufficiently captured in the sample. In addition to using a mobile phone register, including a specific question on nationality or country of origin in the survey design could have proved useful to verify whether the sample is representative of the general population from this perspective too.

In the survey, respondents were first questioned about bicycle sharing and thereafter presented with the questions about car sharing. After asking people what they 'understand by bicycle sharing', the term was explained to all respondents. As a result, it is probable that, after having the term bicycle sharing explained to them, a number of respondents had a better idea of what the term car sharing might mean, even if they did not know before. Therefore, there is a chance that the true percentage of respondents that knew exactly what the term car sharing meant before the survey is lower than as captured in the survey.

6.2 Responses to barriers and discouraging factors

In response to the question about factors that would encourage people to use shared bicycles, as well as in response to the statements about cycling safety and the provision of bicycle infrastructure in Malta, the lack of safety for cyclists, and the need to improve cycling safety, and general road safety conditions, emerged clearly as the main factor influencing whether respondents would consider using bicycle sharing or cycling in general. Fishman et al. (2012) found similar results when investigating the low modal share of cycling in Australia: "the most commonly stated reason for not riding a bicycle is fear of motorised traffic". The speed and volume of traffic, the location and direction of parked cars (because of the risk of 'dooring'), and dangerous intersections, including roundabouts, are important contributors to increased (perception of) road safety risks for cyclists (Parkin et al., 2007; Fishman et al., 2012). To this end, Fishman et al. (2012) recommend creating an integrated bicycle infrastructure network, including separated bicycle paths for arterial roads, bicycle lanes and/or reduced speed limits for less busy roads, as well as complementary awareness campaigns to educate drivers about the presence of cyclists. Research into the determinants for cycling, such as presented in the reviews by Pucher and Buehler (2008), Heinen et al. (2010) and Handy et al. (2014), stress the importance of a mix of interventions to promote cycling: creating dedicated cycling infrastructure, implementing pro-bicycle policies and legal protection, and developing promotional and educational measures. Ricci (2015) further corroborates that the provision of bicycles through bicycle sharing schemes alone is not enough, and needs to be implemented in conjunction with the above-mentioned measures to increase the level of cycling.

In the survey, respondents who indicated not to consider using bicycle sharing or car sharing at present were asked what factors might encourage them to start doing so. Out of the 292 respondents who do not currently consider using bicycle sharing, 99 respondents indicate that they 'prefer using their private transport'. Among those who do not currently consider using car sharing (n=200) that figure is even higher, with 107 respondents giving this answer. While these results are not surprising, considering the high modal share of the private car, and the general car dependence in the nation, it is a clear example of the tragedy of the commons, where maximising personal self-interest results in diminished collective utility (Hardin, 1968; Briguglio and Bonello, 2018). While almost all Maltese citizens recognize that road congestion and related environmental problems are a major issue (European Commission, 2013), a large share of the surveyed respondents would still prefer to carry on business-as-usual, and would not want to make a change themselves. As argued by Woodcock and Aldred (2008), driving a car has become such a normal part of life

that many people no longer question its use, even for short distances. In addition, car dependence creates distances that can only be overcome by car and infrastructural designs that sever communities (Woodcock and Aldred, 2008). To overcome car dependency, the focus needs to shift from accessibility and mobility for cars to accessibility and mobility for people. This can be realised through a mix of transport and land-use policies intended to limit private motorized transport and enable and encourage the use of active and public transport modes (Givoni and Banister, 2013; Zipori and Cohen, 2015).

Of the respondents that had already indicated that they would not consider using bicycle sharing (n=292), 22.3% indicated that ‘nothing’ would encourage them to start use shared bicycles. In research on cycling, a common typology used to segment different types of cyclists in categories (based on initial findings from Portland, but later vetted with data from other cities from the US) roughly follows this distribution: <1-2% of strong and fearless cyclists, those that will cycle regardless of conditions, generally young, fit and male; ~7-10% enthused and confident, those who have been attracted to cycling by minimal construction of bicycle infrastructure; ~50-60% interested but concerned, those who are interested in cycling, but are concerned for their safety and afraid of cycling on roads with cars; and ~30-35% not interested, those who have a lack of interest in cycling or cannot for reasons of topography or physical inability (Geller, 2006; Dill and McNeil, 2013). Receiving the response that ‘nothing’ would encourage someone to take up bicycle sharing may therefore be expected from at least part of the sample, and the percentage is still well below the segment as found in the US context.

In addition, when asking respondents who indicated they are not at present considering using car sharing (n=200), an even higher percentage of respondents (29.5%) indicated that ‘nothing’ would encourage them to start using car sharing. In the Diffusion of Innovation theory (Rogers, 1962), used to understand the adoption of novel innovations, five adoption categories are identified, roughly following this distribution: Innovators (2.5%), Early Adopters (13.5%), Early Majority (34%), Late Majority (34%), and Laggards (16%) (Rogers, 1962). When applying the diffusion of innovation theory to the adoption of a bicycle sharing system, Therrien et al. (2014) identified a segment of respondents who would be the last to use, or may well never use, the innovation. This group of respondents, the laggards, can be characterized by being generally averse to change, traditionalist, with adverse attitudes toward cycling, cycling safety, and bicycle sharing, and found more among the older age groups, including those who physically cannot cycle. Although physical limitations are less relevant in the case of car sharing, we can still expect a certain group to be conservative and wary of these types of innovations and less likely, if ever, to become a user of the service. Applying the diffusion of innovation theory in a similar fashion as Therrien et al. (2014) can however also enable researchers to identify those most likely to adopt the use of a transport innovation, information which can then be used to better understand the mechanisms that facilitate public uptake and tailor a marketing strategy for this population segment.

There are several identified barriers that can be tackled through tried and tested responses. A large share of respondents, at least 99 out of 292 respondents, indicated ‘not knowing how to cycle’. This can be addressed through the promotion of cycling from a young age (e.g. safe routes to school, bicycle training at school), as well as cycling lessons for all ages (Pucher et al., 2010; Handy et al., 2014). Electric bicycles, or adapted bicycles for those with special mobility needs, can be a solution for at least part of those respondents that said they are ‘not able to cycle due to age or health reasons’, which can be further promoted through the provision of financial incentives by government or employers (de Geus et al., 2008; Pucher and Buehler, 2008). Not many respondents were convinced that using bicycle sharing might save them money or time, or be a convenient alternative mode of transport, which are driving factors for shared bicycle use elsewhere (Ricci, 2015; Fishman, 2016). Marketing and information campaigns have been used successfully in other contexts to compare and communicate potential travel time and cost savings of cycling and bicycle sharing (Handy et al., 2014; Bélanger-Gravel et al., 2016).

7. Conclusions

Shared mobility services are a recent introduction in the islands’ transport system. In this research, a survey was conducted among 362 respondents. The results show that the general unawareness of bicycle and car sharing is high: 55.5% of respondents had never heard of bicycle sharing, and 37.0% did not know what the term car sharing meant. Among those who had heard of bicycle sharing and/or car sharing, there was still a large percentage who misunderstood the concept, thinking it either referred to for example, sharing a personal bicycle with others, or sharing a ride in a car (carpooling).

In line with insights from bicycle sharing systems across the globe, the lack of road safety and the subsequent perception of cycling as very unsafe, emerged as the main barrier for wider uptake of bicycle sharing. This can be improved by creating safer, and where necessary segregated, infrastructure, promoting education of all road users to safely share the road, and implementing a legal framework that protects cyclists, including better enforcement of the rules.

The insights provided by the data can help shared mobility operators to promote these services among the different identified population segments and to plan for the better geographical distribution of such services to ensure they serve a wider segment of society, and can assist policy makers to develop stronger transport and land use policies to promote the use of shared mobility services, with a focus on increasing cycling safety, in the case of bicycle sharing.

Awareness and marketing campaigns are necessary to educate the general public about the purpose, use and opportunities of shared mobility services. In addition, there is a need for the creation of dedicated space for these transport modes in the transport network, in the form of priority lanes, segregated cycling infrastructure and reserved parking facilities.

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