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From a user perspective

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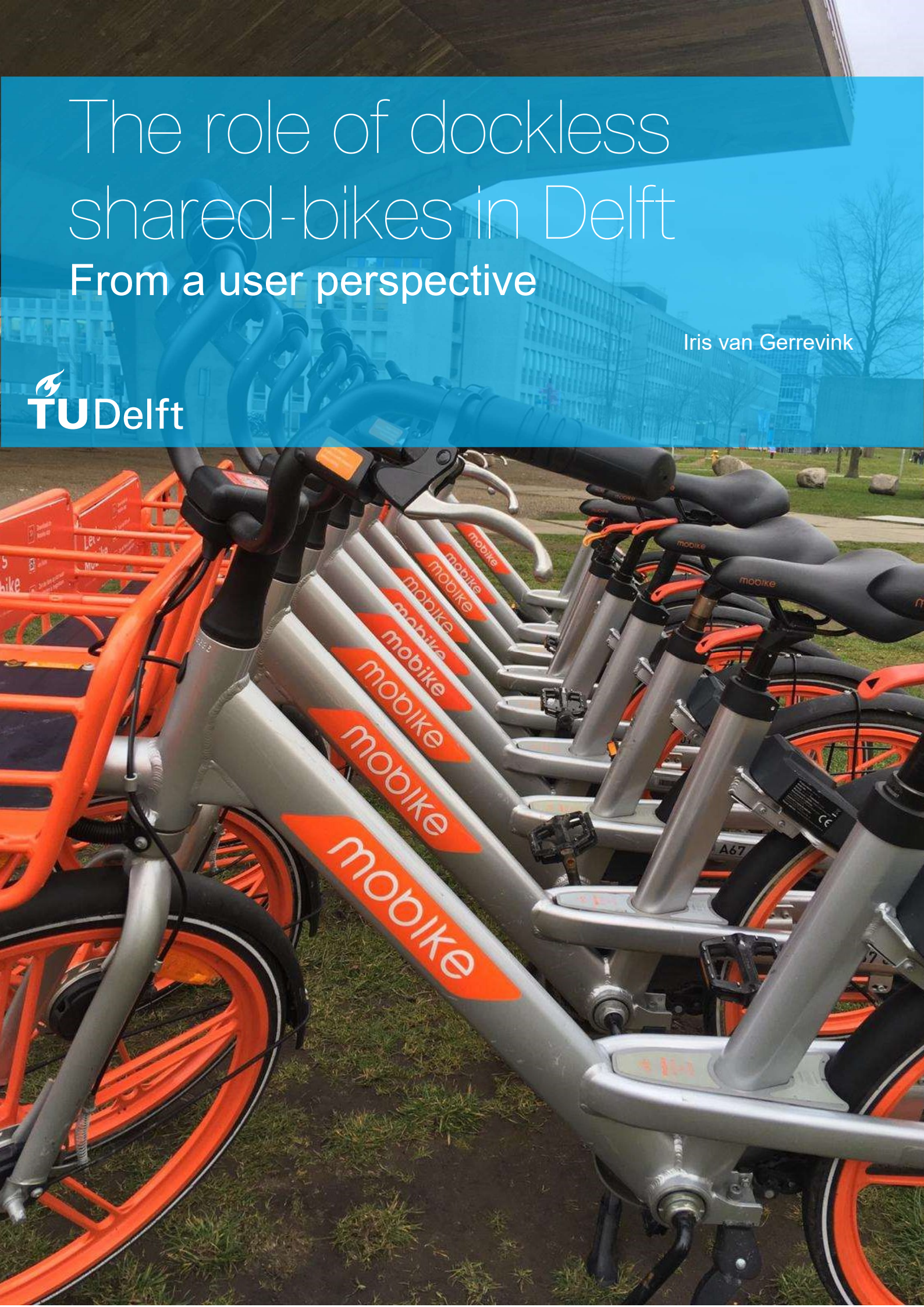

The role of dockless shared-bikes in Delft

From a user perspective

by

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Summary

This thesis provides an insight into the role of dockless shared-bikes in Delft. There is only one type of dockless shared-bike operator active in Delft, known as Mobike. Sustainable mobility and bicycle-sharing is a hot topic in literature. The objective of this thesis is to fill the knowledge gap about the users of shared-bicycles and their motivations to use shared-bikes in Delft, the Netherlands. Literature research, as well as a survey, is conducted.

Bike-sharing is first introduced in 1965 aiming to reduce congestion and improve air quality and is now rapidly increasing in popularity because of their potential to stimulate sustainable urban mobility. Mobike is a Chinese company with more than 9 million bicycles worldwide and over 200 million registered users. Mobike started in Delft as a pilot in March 2018 and expanded the pilot in September 2018. At the moment, there are around 950 Mobikes scattered in Delft. In order to use a Mobike, one requires the Mobike smartphone app to unlock the bike and pay via Mobike's credit system.

Previous empirical research has been done on the trip characteristics of Mobikes in Delft. The key discoveries are that the average number of trips per day per bike is 1.6 and the average length of each trip is 2 km. Many trips have their origin or destination at Delft's railway stations, the TU Delft campus or the city centre.

A survey is conducted to find out what people's motivations are to use a Mobike in Delft. The data is collected by various methods and finally gained 91 useful results. 76% of respondents are students, and in general, people are highly educated. 46% of respondents are commuters who work/study in Delft, 5% are tourists, and the other half are living in Delft. Most of the Delft's inhabitants also own a bike; they are classified as 'casual', occasional Mobike users with the main reason to use Mobike as a temporary replacement for their own bike if it is broken, or one-way trips when their bike is located somewhere else. Most of the commuters, who live outside of Delft, do not own a bike in and use Mobike every (week)day. Their main motivator to use Mobike is out of convenience. Convenience includes accessibility of the bikes, user-friendliness of the app, payment method, the fact that users can park the bike everywhere and not being responsible for the bike after it is locked. There are also questions regarding the trip purpose and alternative travel modes if Mobike would not be available.

All this information finally leads to the main conclusion about the role of dockless shared-bike in sustainable mobility in Delft. From this research, it turned out that 98% of Mobike trips is replacing trips made with other sustainable transport modes such as walking, other forms of cycling and public transport. Thus, in Delft, dockless shared-bikes do not raise the share of sustainable transport modes.

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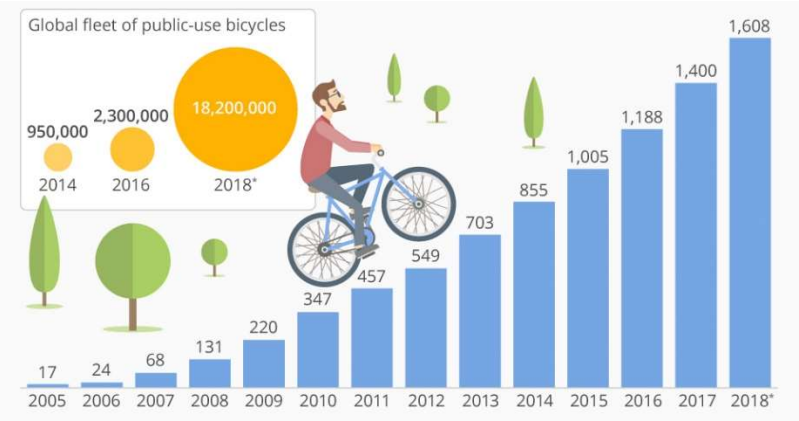
1. Introduction

1.1. Problem context

Sustainable mobility, instead of fuel-based car transport which causes pollution, is a hot topic within urban mobility (Midgley, 2011). Cycling is regarded as an effective, efficient and sustainable transport mode because it is not polluting and reducing car congestion. Bike-sharing, in particular, has the potential to encourage public transport use by providing an efficient first and last-mile travel mode and thus stimulate sustainable mobility (Adnan, Altaf, Bellemans, Yasar, & Shakshuki, 2018). In this thesis sustainable transport or sustainable mobility is defined as the "movement of people and goods in ways that are socially, economically and environmentally sustainable" (Rassafi & Vaziri, 2005, p. 84). To summarise, walking and cycling as well as public transport is regarded as a sustainable transport mode.

Bike-sharing first launched in 1965 in Amsterdam (Shaheen, Zhang, Martin, & Guzman, 2011) and the concept has gained popularity ever since. Bike-sharing schemes have been rapidly implemented globally, especially in the last two decades (Figure 1 displays this expansion from 2005 to 2018).



** Data based on May 2018*

Figure 1: Estimated number of bike-sharing programs worldwide. Source: (Meddin, 2017)

1.2. Knowledge gap

Just like the global rise of public bicycle sharing schemes (PBSS), in the last two decades, a lot of literature has been published on the (shared-)bike as a sustainable solution to transport problems. However, as Adnan and colleagues state: "*User's preferences investigation considering the PBSS as a first/last-mile for multi-modal trips are scarce in the literature, despite the fact that PBSS have shown significant potential to complement mass PT systems. There exist a single study (Ji et al. 2017) for a large city in China.*" (Adnan *et al.*, 2018 p.3). Similarly, quoting Bachand-Marleau, Lee, & El-Geneidy: "yet little is known about the users of the systems and their motivations" (2013, p.66) Hence not much is known on the potential of bike-sharing programs to stimulate sustainable urban mobility. Similarly, as part of recent master theses, unique research has been done of dockless bike-sharing in Delft. One study by Robert Donkers researches how Mobike can be successful in the Netherland in the short- and long term (Donkers, 2018). The other thesis focused on the analysis of data in order to get insight into the performance of bike-share operations (Boor, 2019). However, as the author indicated in his report, qualitative research such as user's motivation, preferences and opinion on shared-bikes (in Delft) is still missing. In order to better synergise bike-sharing systems and public transportation, as part of sustainable mobility, it is essential to understand which role shared bikes play in the current society. The objective of this thesis is to fill that knowledge gap.

1.3. Research questions

The main question of this thesis is:

How does dockless bike-sharing influence sustainable mobility in Delft?

The research questions are:

1. Which factors influence the usage of shared-bikes?
2. How are dockless shared-bikes used within Delft?
3. What is the user's motivation for using dockless shared-bikes?

1.4. Scope

Delft

As the subtitle of this research already suggests, the focus is on Delft as a small city in the Netherlands. The Netherlands is famous for its bicycles, and as stated before, in Amsterdam the first generation of bike-sharing was implemented.

Dockless bike-sharing - Mobike

In Delft there are two bike-sharing programs active, 'OV-fiets' (public transport bike) and Mobike. The OV-fiets is operated by the Dutch railway operator (NS) and has bicycles available at almost 300 docking stations, two of which in Delft (NS, n.d.). Mobike operates differently because it is a fully dockless service (Jia, Liu, & Liu, 2018). The concept of Mobike will be explained in more detail in paragraph 2.2. Characteristics of Mobike. Since March 2018 Mobike is active (as a pilot) in Delft. There already have been two master theses on Mobikes in Delft last year, as described in paragraph 1.2. This means there is quite a lot known about the operation of Mobike in Delft but not yet specifically on user's motivation, preferences and opinion of Mobike, this thesis aims to build on those studies and expand the current knowledge.

1.5. Methodology

This section describes the research methodology. It describes how the research is done and which choices are made. The methodology follows from the research objective and the research questions. An overview of the research approach is presented in Figure 2.

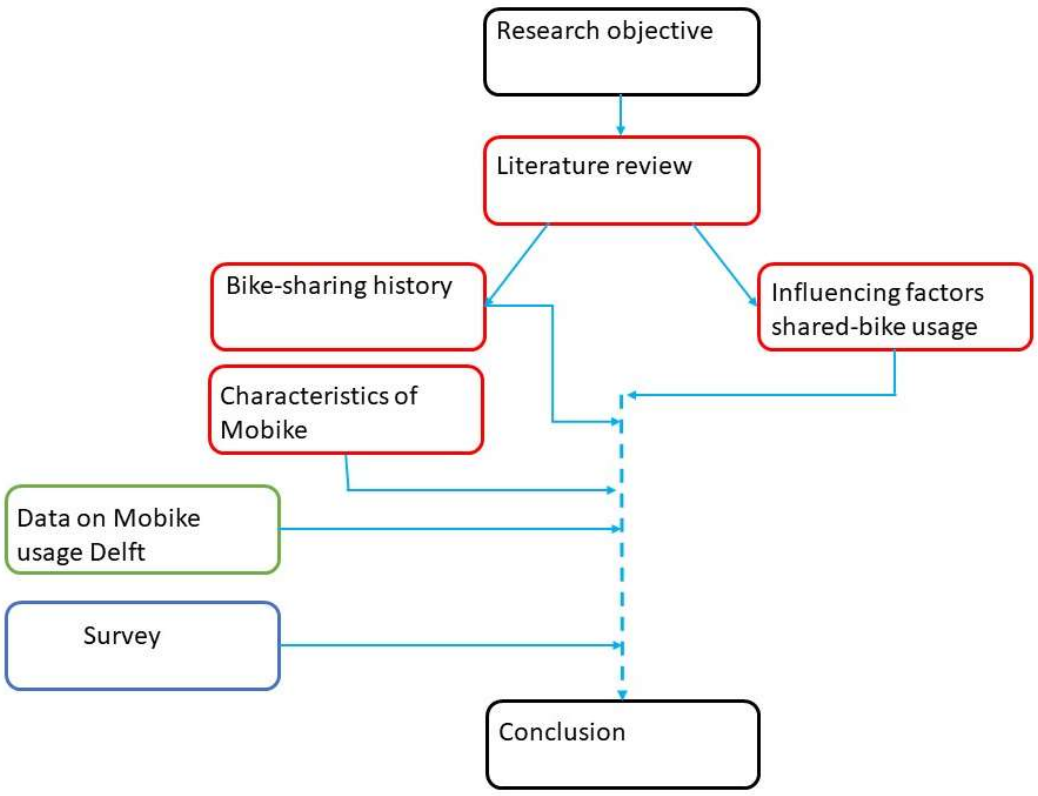


Figure 2: Overview research approach

Literature research is conducted to explore the background, potential and influencing factors of bike-sharing and aims to answer research question 1 directly; *Which factors influence the usage of shared-bikes?*

To answer research question 2: *How are dockless shared-bikes used within Delft?*, a summary and evaluation of the data presented in Sven Boor's (2019) research will be provided. This data contributes to the understanding of the use of dockless shared-bikes before further elaborating on the reasons why those bicycles are used in that way.

For answering research question 3: *What is the user's motivation for using dockless shared-bikes?*, a questionnaire is held. The survey gives insight into the user's demographics, why they are using bike-sharing systems and how they would travel alternatively if shared-bikes were not available. In chapter 5 the set-up of the survey is discussed in more detail.

1.6. Report structure

This thesis is structured as follows. Chapter 2 describes the history and evolution of bike-sharing concepts. The second part of the chapter contains more detailed information on Mobike's characteristics and their implementation in Delft. Chapter 3 contains the literature review on the influencing factors of shared-bike usage. Chapter 4 provides an overview of how dockless shared-bikes are used within Delft based on previous research. In chapter 5 the questionnaire required to answer research question 3, is discussed. Chapter 5 also contains a short overview of Delft's population and inhabitants travel behaviour. Chapter 6 presents the results and discussion of the survey results. In chapter 7 a general discussion on the research and results is presented, and finally, in chapter 8 a final conclusion is drawn that answers the main question of this thesis: *How does dockless bike-sharing influence sustainable mobility in Delft?*

2. Bike-sharing overview

2.1. Bike-sharing history

The first ever bike-sharing program called 'White Bike Plan' was launched in Amsterdam in 1956 (DeMaio, 2015; Shaheen, Guzman, & Zhang, 2010; Shaheen et al., 2011) Fifty white-coloured bikes were scattered around the city, free to use. The scheme soon failed because the bicycles were damaged or stolen (Efthymiou, Antoniou, & Waddell, 2013; Shaheen et al., 2010). In 1974 free bikes were introduced in La Rochelle, France and later in 1993 in Cambridge, United Kingdom. Except for La Rochelle, they soon failed because of vandalism and theft (Shaheen et al., 2010).

Figure 3: Amsterdam's White Bike. Source: (Pas, 2015)

The second-generation of shared-bikes operated with bikes for which a coin-deposit was required in order to prevent theft. Copenhagen bike-sharing program, City Bike started in 1995 and is still operating ever since. These bikes are easily distinguishable, have designated docking stations and need a coin deposit to unlock the bikes (DeMaio, 2015; Shaheen et al., 2010). This design led to more reliable systems and better protection against theft. Although it still had some negative aspects, since the deposit fees were quite low and there was no time restriction, users tend to use the bikes for extended periods or even keep them (Lozano et al., 2018; Shaheen et al., 2010).

After those two concepts, the third-generation of shared-bikes was deployed. In this generation, advanced technologies are incorporated to track the bikes and deter theft. The bike-sharing program Bikeabout at Portsmouth University in 1996 operated with a magnetic card to rent a bike. The technologies have been continuously evolving, changing and improving the unlocking systems to for example mobile phone access. When a few concepts proved very successful more cities and companies became interested in starting their own scheme (DeMaio, 2015). This led to a global rise in bike-programs as shown in Figure 1.

In 2014 the first fourth-generation bike-sharing scheme was implemented. The main characteristic of the fourth generation of bike sharing is the absence of docking stations and a further improvement of the usability and efficiency (Lozano et al., 2018). The first revolutionary dockless bike-sharing scheme is Ofo operating in China.

Figure 4: Ofo-bikes. Source: (Mokkie, 2018)

In general, the reasons for introducing bike-sharing programs to reduce congestion and improve air quality and increase mobility choices. The first bike-sharing program was initiated by the Provos, a Dutch counterculture movement. This plan aimed to solve congestion and air pollution problems in the inner city of Amsterdam (van der Zee, 2016). The second and first generations were deployed in already cycling cities, with the growing interest in sustainable mobility and the development of the systems to minimise some issues, the third-generation of bike-sharing programs were also deployed in less cycling countries and has shown the potential to reduce greenhouse gases by discouraging the use of fuel-based vehicles (Shaheen et al., 2010).

2.2. Characteristics of Mobike

Like Ofo, Mobike is a fourth-generation bike-sharing scheme. In June 2018 Mobike operated globally with more than 9 million bikes in 200 cities in 19 different countries and had over 200 million registered users (Mobike Global, 2018).

Figure 5: Europe's Mobike cities in October 2018

Mobike is active in Delft since March 2018. It started as a pilot with 100 bikes to improve the accessibility of Science Park Zuid by providing shared-bikes to stimulates their usage as a first and last mile to and from Delft railway station. In September 2018 the council decided to add another 800 bikes (*Leidraad voor gemeentelijk deelfietsbeleid: dossier deelfiets*, 2018). Rotterdam is the only other city in the Netherlands in which Mobikes operates. Mobike describes itself as *"a bike sharing service to fulfil urban short trips - anytime, to any legal parking destination - by combining innovation and today's IoT (Internet of Things) technology. Mobike is green, reduces congestion, and continually strives to improve the quality of city life."* (Mobike, n.d.).

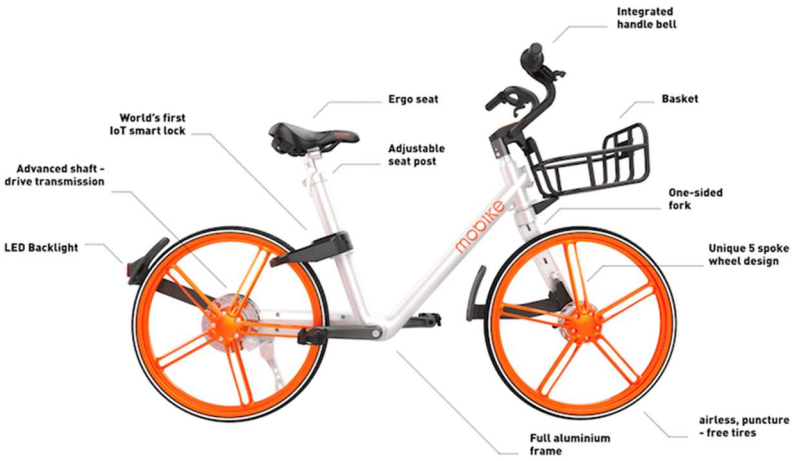


Figure 6: Dutch Mobike. Source: (Mobike Nederland, 2017)

Mobike is a dockless service and is equipped with a smart lock that combines GPS and telecommunication. Potential users need to download the Mobike smartphone application to locate nearby bikes (see Figure 7) after which they can unlock them by scanning a QR-code on the lock. After a trip, users are free to park the bike everywhere within the service area (except for no-parking spots allocated by the local government), see Figure 8. Users can receive a fine of €10,- if they do not comply with the rules[1].

[1] Retrieved in February 2019

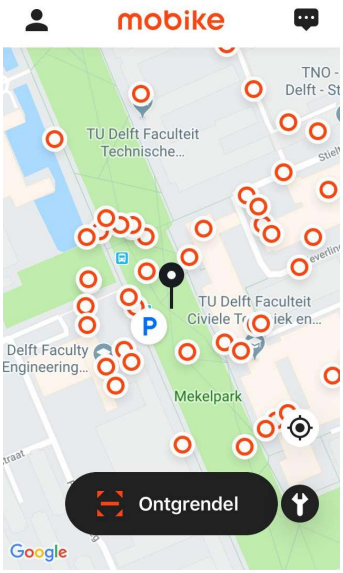


Figure 7: Available nearby Mobikes

Figure 8: Service area Delft in blue and no-parking zone in grey

Before new users can start using the bikes, a €5 deposit is required. Mobike uses a credit system, meaning that users have to top-up their balance in order to extend their subscription. Topping-up is possible via credit card or Ideal. There are two types of subscriptions. Users either pay per use, which costs €1.50 for 20 minutes or have a monthly subscription for €9.90 (Mobike Nederland, 2018).[2]

For Robert Donkers' research nine people were awarded a free one-month Mobike subscription after which they had to participate in a survey how they liked Mobikes and if they would buy a subscription themselves. A few interesting things the users mentioned are that the bikes are not comfortable; the design is based on short(er) people and not suitable for tall Dutch people. Secondly, they mentioned there is often something wrong with the bikes and finally, they said that they could not trust that there would always be a bike available nearby if they needed one (Donkers, 2018). The first thing is appealing because the Mobikes that were implemented in Delft already had a different, bigger design than other bikes in Europe and around the world (*Leidraad voor gemeentelijk deelfietsbeleid: dossier deelfiets*, 2018).

[2] Costs retrieved in February 2019

3. Influencing factors of bike-sharing

In this chapter, a literature review is performed in order to answer research question 1: *Which factors influence the usage of shared bikes?*

3.1. Methodology

The literature used for this review is selected through searches in the databases of Scopus and Google Scholar. Searches are done on the combination of words "bike-sharing/bicycle-sharing" – "influence/influencing" – "factor". Sources were then selected after reading the abstract. Secondly, when an interesting article was found, the reference list was looked at to find other papers. After scanning through the articles first, a list was made of influencing factors and whether they have a positive or negative influencing. This relationship is described as either positive or negative and ++,+,- or --. The factors are divided into four groups: socio-demographic factors, transport factors, built environment factors and other. Table 1 shows these factors, their relationship and the main sources. The following paragraph discusses some factors.

3.2. Influential factors

User characteristics

Research has found that individuals perceive shared-bikes as a travel option that minimizes bicycle theft (Bachand-Marleau et al., 2013; Campbell, Cherry, Ryerson, & Yang, 2016; Fishman, Washington, & Haworth, 2013; Fuller, Sahlqvist, Cummins, & Ogilvie, 2012; Shaheen et al., 2010) . In Montreal's case study this seemed a crucial reason for people to use the bike-sharing system (Bachand-Marleau et al., 2013). Moreover, they observed that shared-bikes are appealing as a one-way trip. Influencing factors of getting a subscription to the program are related to whether people already owned a private bike and if they liked the design of the bicycles and valued them as comfortable (Bachand-Marleau et al., 2013; Donkers, 2018).

Regarding the gender of bikeshare users, there are mixed findings. For example, (Buck et al., 2013) found that females use bike-sharing systems more often than males. However, while Fishman et al. analysed a higher percentage of males using bike-sharing programs (Fishman, 2016; Ma, Yang, Ji, Jin, & Tan, 2018; Rijsman, 2018). Therefore, Ma et al. stated that the ratio is related to the overall popularity of cycling in a country (Ma et al., 2018; Rijsman, 2018).

Transport factors

For third-generation shared-bikes with a fixed parking, the location of the docking stations close to their origins and destinations is crucial to the number of people using a bike-sharing system (Bachand-Marleau et al., 2013; Fuller et al., 2012; Hyland, Hong, Pinto, & Chen, 2018; Sun, Chen, & Jiao, 2018). This factor does not apply to dockless-services, in that case, the number of available bikes (Jäppinen, Toivonen, & Salonen, 2013; Pucher, Garrard, & Greaves, 2011) and the compactness of the service area becomes more important. Secondly, mandatory helmet legislation, for example in Australia, acts as a barrier to bike-sharing (Fishman, Washington, Haworth, & Mazzei, 2014).

Moreover, finally, one study has specifically examined the influence of a strike by metro personnel on the usage of shared-bikes. Right after the strike the usage of shared-bikes increased significantly. However, over time this effect fades (Fuller et al., 2012).

Built environment

An attractive built environment, with mixed land use and green spaces, stimulates cycling. Especially casual trips by tourists. Inclinations in the area are a big barrier to bike-sharing, in cities with slopes between 4 and 8 per cent, topography becomes a significant constraint (Harms, Bertolini, & Brömmelstroet, 2014; Midgley, 2011).

Other

Under the 'other' group fall factors such as weather-related factors. Not very surprisingly, adverse weather conditions such as rain, snow and low temperatures decrease the amount of cyclist and of course, the use of shared-bikes (Sun et al., 2018).

Table 1: Influential factors of (shared-)bike usage, with indication of the factor's influence and relevant sources.

Factor	Relation on usage of shared-bikes	Source
User characteristics		
Committed year-round cyclist owning a bike	-	(Bachand-Marleau et al., 2013)
People who previously experienced bike theft	++	(Bachand-Marleau et al., 2013)
Individuals who like the design of the shared-bike	+	(Bachand-Marleau et al., 2013; Ricci, 2015)
Transport		
Public transport facilities	Depends on city size, density and supply of public transit	(Sun et al., 2018)
Accessibility	++	(Jäppinen, Toivonen, & Salonen, 2013; Pucher, Garrard, & Greaves, 2011; Sun et al., 2018)
Convenience and desire to avoid theft of private bike	+	(Bachand-Marleau et al., 2013; Campbell et al., 2016; Fishman, Washington, & Haworth, 2014; Fishman, Washington, Haworth, et al., 2014; Fuller et al., 2012; Shaheen et al., 2010)
Immediate access to helmets in countries where they are mandatory	-	(Fishman, 2016; Fishman, Washington, Haworth, et al., 2014; Jain, Wang, Rose, & Johnson, 2018; Midgley, 2011)
Proximity docking-stations to home	++	(Bachand-Marleau et al., 2013)
Proximity docking-stations to regular destinations	+	(Bachand-Marleau et al., 2013)
Proximate to public transit stations	Regular members: + Daily customers: -	(Faghih-Imani & Eluru, 2015; Faghih-Imani, Eluru, El-Geneidy, Rabbat, & Haq, 2014; Sun et al., 2018)
Adding new docking-stations	- (if not too close to other stations). Critical relation	(Fuller et al., 2012; Hyland et al., 2018; Sun et al., 2018)
Bikes are well-maintained and in good operating condition	+	(Donkers, 2018)
Technology, real-time information, security and privacy	+	(Donkers, 2018)
Public transport strike	Short after strike: ++ Long after strike: no effect	(Fuller et al., 2012)
Built environment		
Mixed land use, retail, green space	+	(Chen, Liu, & Sun, 2018; Goetzke & Rave, 2011; Su et al., 2014)

Percentage office, green space and school land use	-	(Fishman et al., 2015; Sun et al., 2018)
Compact urban environment	+	Research for cycling in general (Heinen, van Wee, & Maat, 2010; Moudon et al., 2005; Sun et al., 2018)
Bike infrastructure: roadway design, bicycle lane, number of traffic lights	+ on safety and convenience	Research for cycling in general (Buck et al., 2013; Chen et al., 2018; Faghih-Imani et al., 2014; Midgley, 2011; Sun et al., 2018)
Attractiveness of built environment (recreational bicycle trips)	+	Research for cycling in general (Sun et al., 2018)
Hilly areas	-	Research for cycling in general (Harms et al., 2014; Midgley, 2011)
Other		
Adverse weather conditions (snow, precipitation, humidity levels)	--	Research for cycling in general (Sun et al., 2018)
Low temperatures	-	Research for cycling in general (Borgnat et al., 2011; Cheng & Liu, 2012; El-Assi, Salah Mahmoud, & Nurul Habib, 2017; Sun et al., 2018)
Non-working days	-	Research for cycling in general (Borgnat et al., 2011; El-Assi et al., 2017; Faghih-Imani et al., 2014; Sun et al., 2018)

3.3. Conclusion

Not all factors presented in Table 1 are relevant or applicable to Mobikes in Delft or this research. In the Netherlands, there is no legislation regarding the use of helmets. The Netherlands, in general, is a typical cycling country with appropriate cycling infrastructure, relatively compact urban environment and a flat landscape with not many elevations. Furthermore, in a cycling country, there are generally more year-round cyclist and the influence of the weather typically less.

Other interesting facts that followed from the literature is the perception of convenience and its strong influence. Convenience can be split up into various underlying reasons such as the fear of bicycle theft, and the accessibility closely linked to the technology of the bike-sharing scheme.

To test and account for some of these factors in this research, attention is given to the weather circumstances during the data gathering period. The convenience factor of using shared-bikes, this is taken into consideration within the options in the survey design.

4. Key characteristics relating to the use of Mobikes in Delft

This chapter will answer research question 2: *How are dockless shared-bikes used within Delft?* To answer this question only data from Mobikes, as a dockless service, is used. Because Mobike itself is not willing to share its data for research purposes, this chapter provides an overview of an earlier study on Mobikes in Delft regarding trip characteristics.

Sven Boor has created a way to download a sample of the data in the Mobike app every 5 minutes. With this information, he was able to get an overview of if and how every Mobike moved. He conducted his research for two periods of 21 days each in the months June and August-September. During the last period, a total of 994 bicycles were detected of which 38 did not make a trip. The total number of trips detected in the service area are 32339. With this information, the average number of trips per day per bicycle is calculated to be 1.6 (Boor, 2019).

Other relevant data, for this thesis, includes the trip origins and destinations. Those results will be compared to the findings from the questionnaire concerning the purpose of the trips. The Mobike service area in Delft is dived in 8 different zones, see Figure 9, to simplify the following origins and destination matrix (OD-matrix).

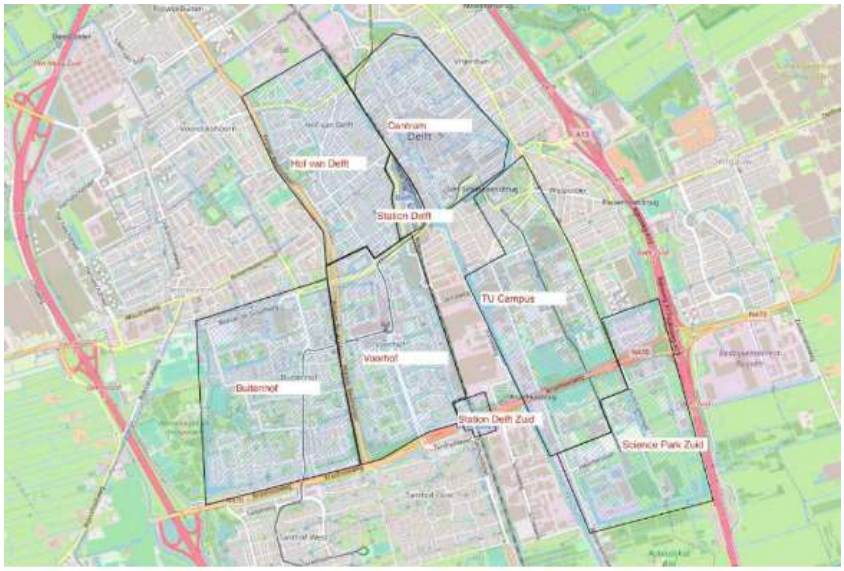


Figure 9: 8-zones of Delft. Source: (Boor, 2019)

Origin/destination	Station Delft	Centrum	TU Campus	Science Park Zuid	Station Delft Zuid	Voorhof	Buitenhof	Hof van Delft	Other	Total
Station Delft	0.1	1.0	3.5	0.2	0.0	0.9	0.3	0.4	1.1	**7.6**
Centrum	1.2	6.2	6.4	0.1	0.1	2.1	0.6	1.1	4.3	**22.0**
TU Campus	3.5	7.9	9.6	0.2	0.6	5.0	1.2	0.8	3.4	**32.2**
Science Park Zuid	0.2	0.1	0.3	0.0	0.3	0.1	0.0	0.0	0.2	**1.2**
Station Delft Zuid	0.0	0.0	0.7	0.4	0.0	0.4	0.1	0.0	0.2	**1.9**
Voorhof	0.9	1.8	4.8	0.1	0.4	3.2	0.9	0.5	1.3	**13.8**
Buitenhof	0.3	0.4	1.7	0.0	0.1	0.6	0.4	0.0	0.3	**3.7**
Hof van Delft	0.5	0.9	1.0	0.0	0.0	0.4	0.1	0.4	0.5	**3.7**
Other	1.2	3.7	3.9	0.1	0.3	1.2	0.3	0.5	2.8	**14.1**
Total	**7.7**	**22.0**	**31.9**	**1.2**	**0.7**	**13.9**	**0.8**	**3.8**	**14.1**	

Table 2: OD-matrix 27 August - 16 September 2018 (percentage based). Source: (Boor, 2019)

What can be concluded from Table 2 is that 18.9% of all trips are related to one of the railway stations. This could indicate the relevance of shared-bikes close to railway stations and the possible use of a first and last mile travel mode. This confirms the findings from the literature research regarding the positive influence of docking-stations (or in the case of dockless shared-bikes, the presence of large concentration of Mobikes) close to public transit stations and regular destinations.

The other interesting thing is the high percentage, 64.1% of all trips to and from TU campus. This probably demonstrates the high usage of Mobikes by students. An animation is created showing all Mobike trips on the 17th of September 2018: https://www.youtube.com/watch?v=MVqJtJA6_wg. Frequent used origins and destinations, as well as student accommodations, are clearly visible.

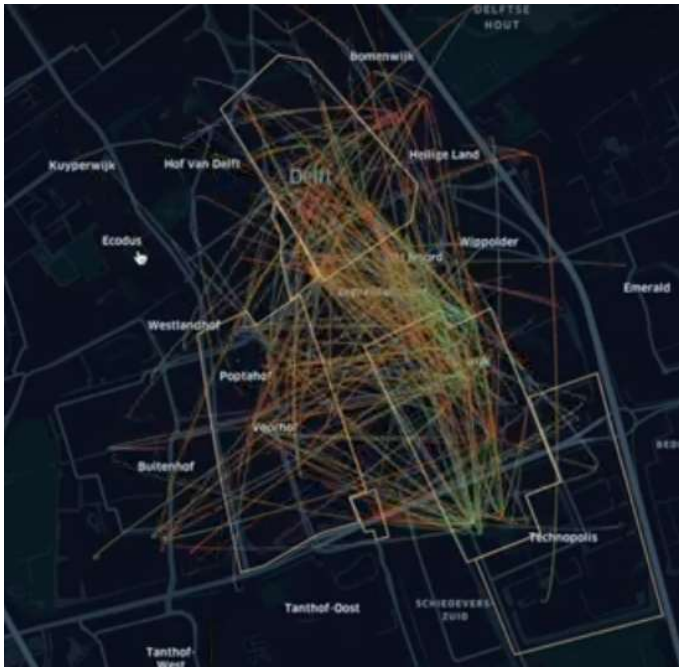


Figure 10: Mobike trips on 17 September 2018 between 14:47-16:40 hours

Another relevant statistic of Sven Boor's research is the average length of the trips and found that it lies around 2 km (Boor, 2019), which is shorter than the average cycling trip in the Netherlands of 3.61 km in 2018 (CBS, 2018b).

Conclusion - How are dockless shared-bikes used within Delft?
Per day, an average of 15 trips is made per 1000 residents (in the service area). One bike makes on average 1.6 trips per day, and a total of 956 active Mobikes were detected in the research period. The TU campus and the city centre are the most frequent origins and destinations. The average length of Mobike trips is 2 km. The usage over time per day does not differ much from the general movement in the Netherlands. However, from 27 August to 16 September, clear peaks were visible during start and end times of TU Delft lectures. Compared to the general movement of the Netherlands Mobikes are more active during the night and slightly in the weekend. Although the bikes are still significantly more used during weekdays than weekend days.

5. Data collection

The objective of this chapter is to present the set-up of the questionnaire in order to answer research question 3: *What is the user's motivation for using dockless shared-bikes?* This chapter starts with an introduction on how the survey is set-up, followed by an overview of the characteristics of the case study area, Delft.

5.1. Survey

Method

The data is collected in various ways. The first method uses flyers with a link to the online questionnaire[3]. Flyers will be attached to numerous parked shared-bikes. The flyers contain a QR-code with a link to the questionnaire. The design of such flyers is attached in Appendix 2.

The questionnaire is made with Google Forms because it is a free survey tool with the required features for this research, such as two languages, export results in CSV-file and logic options to skip questions depending on a given answer.

Respondents can choose if and when they wish to fill in the questionnaire. As Kelley *et al.* (2003) states in their research, the response rate of this method is generally low, about 20%. A large enough sample is required to ensure that the respondent's profile reflects the general population of Mobike users.
That is why, as a second method, also face-to-face interviews will be conducted. At different times of the day, respondents will be approached and interviewed at potential docking locations for Mobikes. The Mobike-app gives insights into the most crowded locations. It does not matter if people are interviewed before or after their trip since the questions are aimed at the reasons why they choose the use a Mobike. The questions posed to these users are exactly the same as the ones in the online survey.

There is no specific target demographic; the aim is to reach every registered Mobike user in Delft. When online respondents submit their survey, the time and date are exported together with their responses. During the period in which the surveys are conducted the weather circumstances, and possible other influencing factors on the usage will be noted and referred to in case the results differ from the expectations and similar research on dockless shared-bikes in Amsterdam (Van Waes, Münzel, & Harms, 2018).

Sample size

To calculate the desired sample size, the following formula is used:

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

- In this case, the population size (N) is estimated to be 1400 trips per day. This is based on the data from Sven Boor as described in Chapter 4.
- The range that the population's responses may deviate from the sample (e) is chosen to be 0.05 or 5%.
- The z-score is based on the confidence level (the probability that the sample accurately reflects the attitudes of the populated), the confidence level is 90%, and z is thus 1.65.
- p = 0.50 (50%) is a standard value.

With these parameters, the sample size should be at least 226.

Survey design

Based on the objective of this research and survey, the first section is to understand the respondent's reasons for using the bike-sharing systems. Secondly, a section of the survey will address if there is an alternative travel mode and which one. After respondents have filled in those two sections, they have the option to answer some extra questions about the demographics of the user. The questionnaire consists of a total of 13 questions. The amount of questions is limited in order to restrict the time needed to fill in the survey and thus improve the response rate. The final screen of the survey will contain a question about whether people are

[3] Link to survey: https://goo.gl/forms/vCu1iy8oDWPVJFE42

interested in answering some more in-depth questions personally. The demographics are interested in order to get an insight into the typical Mobike user and differences in usage among various age groups. At the start of the survey, my contact details will be provided if respondents have questions about the research. The in-depth interviews will only be executed if that seems interesting based on the provisional results of the survey. The questions are listed in Appendix 1. The questions are partly based on an earlier survey of a dockless bike-sharing program, Flickbike in Amsterdam (Van Waes et al., 2018). With the online survey, respondents get to choose if they would like to proceed in Dutch or English.

Figure 11: Flyers attached to Mobikes

Execution
The execution of the survey began on Tuesday 26th of February by attaching flyers to Mobikes parked on TU campus, around Delft station, at busy Mobike parking spots near student accommodations and in Delft city centre, see Figure 11. This process is repeated several times to reach all active Mobikes in Delft. Moreover, since this approach did not seem to get enough results, also some advertisements were posted in Facebook groups with many members, mostly, students and potential Mobike users. Secondly, posters were put in the elevators and several notice boards at the civil engineering faculty.

After two weeks of attaching the flyer onto Mobikes, I received an email from Mobike Netherlands to ask if I could immediately stop with the distribution of the flyers. This meant the only method left was to approach Mobike users when they parked or got on their bike.

Five times for 30-45 minutes, Mobikers at the Mobike parking at Delft station were approach and asked to conduct the survey. The same is also done twice around TU Aula and Library during the lunch break. If people were in a hurry and did not have time, flyers were handed out so they could fill in the survey later. In total, the collection period lasted 18 days. The provisional results already appeared to be meaningful enough to draw a conclusion. During the face-to-face approach, some people gave an extensive explanation about their reasons to use a Mobike. Moreover, some people also commented in the online survey. Therefore, in-depth interviews are not conducted because they did not seem to add significant value

5.2. Case study area: Delft
This section discusses Delft, the study area where the survey is conducted. The area, travel and cycling characteristics and demographics are examined. These findings are compared to the results of the survey in the next chapter to check whether one population group is over-/underrepresented in Mobike users' demographics. In March/April 2018 the municipality of Delft surveyed to get an insight into the used travel modes for trips made within the city. The survey was spread amongst their subscribed panellists. 1621 people have responded.

Transport
The modal split of trips within the municipality of Delft is as follows: 46% cycling, 27% walking, 20% car and 3% public transport. Journeys with destination to TU Delft and Technopolis, the share of the bicycle is even bigger, namely 79%. To the railway stations, an average of 47% (Delft CS) and 51% (Delft-Zuid) of the trips are done on a bicycle (Gemeente Delft, 2018).

Travel purposes
76% of the respondents cycle to/from work/home within Delft if the weather is nice. During unfavourable weather, this percentage decreases with 18% (Gemeente Delft, 2018).

Population

In January 2018, Delft had a total of 102 253 inhabitants. With 53%, men are slightly in the majority (CBS, 2018a). Figure 12 shows the age distribution of Delft's inhabitants.

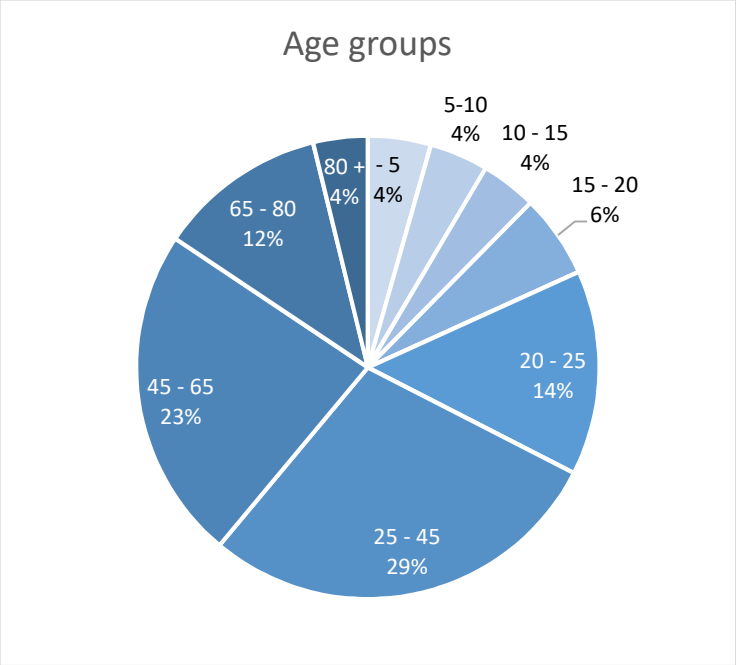


Figure 12: Age distribution Delft, 1 January 2018. Source: (CBS, 2018a)

6. Survey results

In this chapter, the results of the survey are presented and discussed. The survey is set-up to eventually answer research question 3: *What is the user's motivation for using dockless shared-bikes?*

6.1. Analysis

At the end of the research period, there were 91 useful results. 8 people opened the survey and had not used a Mobike before, so they were excluded from further questions. 90%, 82 respondents have also answered to section 2 of the questionnaire, the demographic data.
In the following chapter only the most significant question results are discussed, primarily because of clarity and a lack of space. However, a complete overview is presented in Appendix 3.

The percentage that does not own a bicycle in Delft is 53%, 47% does own a bicycle in Delft. 49% lives in Delft, 46% comes to Delft to study or work but live somewhere else. 5% (4 people) were tourists in Delft; they are excluded from further analysis because the group is too small. How often respondents use a Mobike is presented in Figure 13.

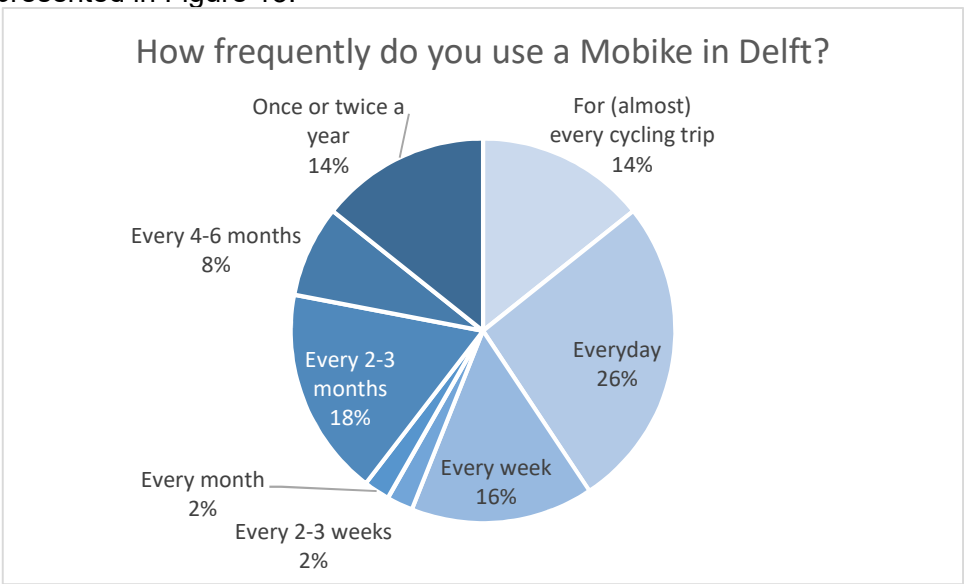


Figure 13: Frequency of Mobike use

A comparison between ownership of private bike and the frequency of use is made in Figure 14. A graph combining frequency of use and whether or not respondents live in Delft or commute to Delft for work/study has a similar outlook. 78% of the respondents living in Delft, owns a bike. 87% of the commuters do not own a bike in Delft.

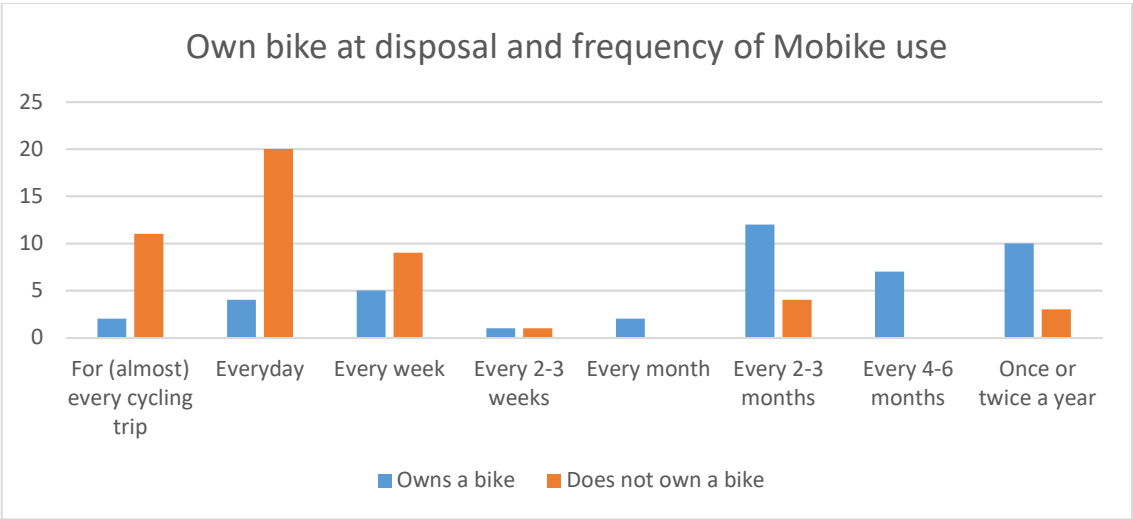


Figure 14: Private bike and frequency of Mobike use

Figure 14 shows that bicycle owners tend to use a Mobike much less often. Comparing this finding to Figure 15. The majority of bicycle-owners (hence inhabitants of Delft) use a Mobike as a temporary replacement. In total, 32% of respondents use Mobike as a tempory replacement, and 31% regards Mobike as the most convenient travel mode compared to alternatives.

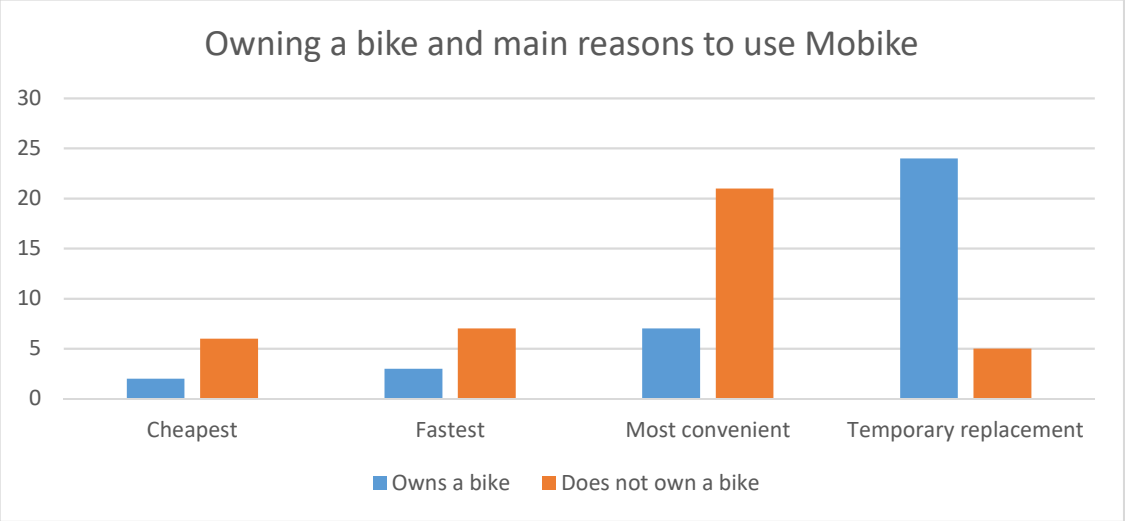


Figure 15: Private bike and main reasons for using Mobike. (More reasons were given, but those with few responses have been omitted from this graph)

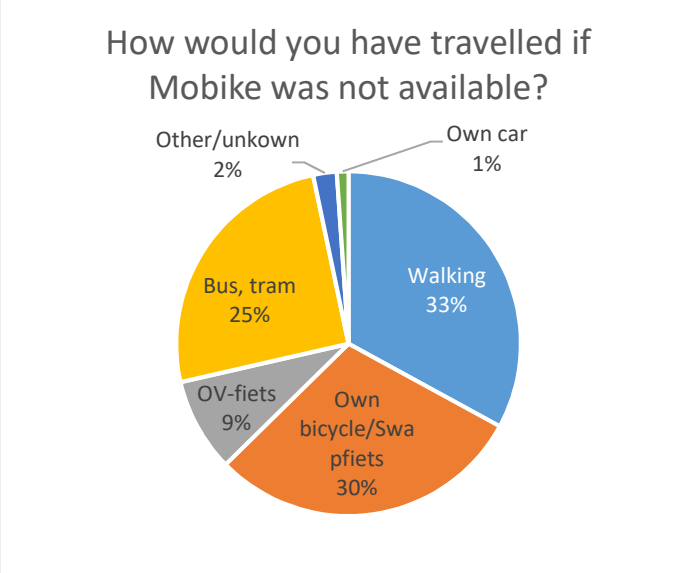


Figure 16: Alternative travel modes

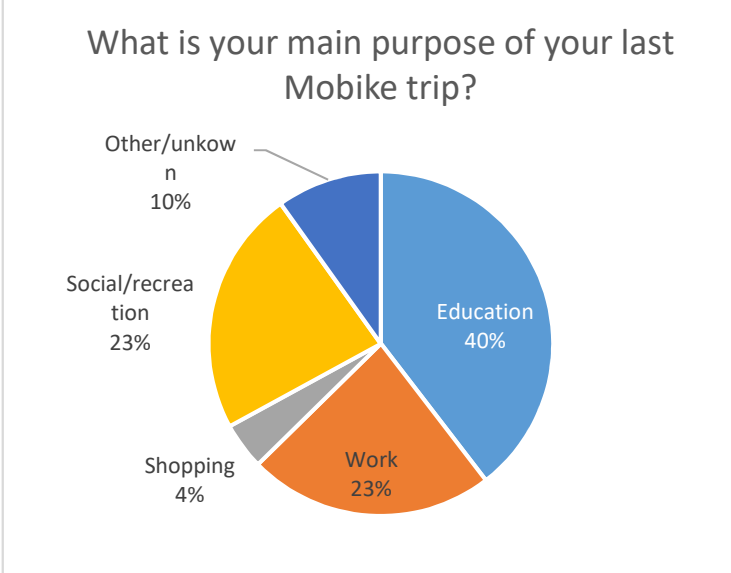


Figure 17: Main purpose of Mobike trip

Bearing in mind that most Mobike trips in Delft are approximately 2 km, Figure 16 shows that the most common alternative travel mode is walking with 33% of answers. Cycling with own bicycle/Swapfiets or OV-fiets accounts for 39%. Except for one response, everyone uses Mobike as an alternative for other sustainable transport modes. Note that respondents had nine options to choose from and the ones are shown in the graph are the only ones chosen. Options like, shared-car and taxi are not selected.

Figure 17 presents an overview of the main purposes of Mobike trips. Most respondents picked education as the best description of their trip purpose. There is quite a large percentage of the category 'other/unkown'; this has to do with the fact that some people choose for the option 'other (specify)' and described their trip, where they came from and where they went, instead of specifying the purpose of their entire trip.

Demographics

65% of respondents are between 18 and 24 years old, 27% is between 25 and 34 years old. 77% is male, and 76% are students versus 24% working. 79% is studying/ has studied at university.

6.2. Discussion

Potential bias based on survey method

The flyer method is likely to be the least biased because every Mobike user is reached regardless their age, gender, education etc. but because this did not raise enough responses other methods are added. By using Facebook, and specifically groups with students, as a means to spread the survey, the demographics are potentially influenced by relatively more responses of students, young and highly educated people. From the results, it is also clearly visible that via Facebook many infrequent users are targeted (Figure 31 in Appendix 3).

Face-to-face interviews are only conducted at TU Delft campus and Delft station. This means that there could be a potential bias in the results because I mainly get in touch with (daily) commuters, hence frequent Mobike users. Nevertheless, interviews are not conducted at other locations because the concentration of Mobikes and the pick-up/drop-off times are quite condensed. Between 08:00-09:00, 25% of the total number of trips (departing from the station on an average weekday) departs, which is extremely high compared to other times a day. Between 17:00-18:00, 15% of all arriving trips each day, arrives at the station (Boor, 2019). The time needed to get as many responses somewhere else is much more that is why increasing the number of responses is valued higher than a potentially more diverse group of respondents. Moreover, different types of users are easily distinguishable (Figure 31 in Appendix 3).

Confidence

The desired sample size was set to be 226 with a confidence level of 90% and a margin of error of 5% (Paragraph 5.1. Survey). The desired amount of responses is not reached with a total of 91. When raising the margin of error to 10% (and keeping everything else the same), the sample size should be 90, which is approximately the case. However, with the various methods used, not only daily users but also casual users are targeted. This means that the assumed population size is not correct. An adequate population size should be the total of registered (app) users of Mobike Delft: 10.000[4] (Oremus, 2018). In that case, only approximately 1% of registered users participated in the survey.

Response rate

It is impossible to define the response rate because it is indeterminable how Mobike users actually looked at the flyer/poster/Facebook post and did not fill in the survey. An estimate of 500-600 flyers are attached to Mobikes. Some stayed on the bike for several days while others were quickly removed.

The face-to-face interviews worked well with almost everyone willing to answer the survey questions. From the people that were not available a high percentage still completed the survey later by scanning the QR-code on the flyer.

Influence of weather

The research is conducted in the winter season with temperatures between 7 and 16 degrees Celsius. During the research period, there were many days with very strong winds and some showers. In general, one could say that the weather circumstances were not very favourable to go cycling. However, since there is no data available on the number of trips made in this period, it remains unclear if the weather has influenced the usage. On the other hand, the weather has influenced the survey method. The flyers were not designed to withstand rain; therefore they were not distributed during periods of rain. Secondly, face-to-face interviews were also only conducted during dry weather. There could potentially be more responses if the weather had been better.

Alternative travel modes

Only one person chose the option car as an alternative travel mode if Mobike was not available. This could have various reasons. Firstly, the share of students in respondents is quite large and not many students have a car available. Secondly, commuters who work/study in Delft but live somewhere else are not very likely to use their own car on the activity side of their trip or last-mile travel.

[4] Registered users at the end of September 2018

Mobike demographics compared to Delft general population
Most Mobike users are students, 76%, and are young and high educated compared to the general population of Delft. Males are overrepresented with 77%.

One could expect that the alternative travel modes to Mobike would correspond to the modal split of all trips within Delft. This is not the case, especially the share of cars (20% in Delft compared to 1% of alternatives for Mobike) does not match.

6.3. Conclusion

In order to give a profound answer the research sub-question of this chapter *(What is the user's motivation for using dockless shared-bikes?)*, different types of users must first be separated to answer the question for each type of user. The users could be divided into regular and casual users. Regular users being defined as using a Mobike at least once a week and casual users using Mobike less than once a week. In general, it could be concluded that for regular users the convenience is their primary motivator and casual users use a Mobike as a temporary replacement for their own bike or one-way trips when their bike is parked somewhere else.

However, also a more in-depth characterisation is possible. Robert Donkers has identified four types of users: commuters, students, (day)tourists, people who use a Mobike as a temporary replacement (Donkers, 2018). The results of the questionnaire confirm this characterisation largely. However, students seem to be a large part of the people who use Mobike as temporary replacement and Robert Donker's characterisation misses out on employed people working in their home town. Three categories of Mobike users in Delft are identified in this research: commuters, inhabitants of Delft, tourists. In the following part of this research, the term 'commuter' is defined as persons who regularly travel to school/university or work in Delft but live somewhere else.

Commuters
Commuters form 46% of the respondents and can be classified as regular Mobike users because they generally use Mobike at least weakly or every (working) day as an access or egress mode. They usually do not have a bike at their disposal in Delft and thus use Mobike as a (permanent) replacement. Their motivation to use a Mobike is most of the time because of convenience. The term convenience includes things like accessibility, the user-friendliness of the app/payment method/unlocking of the bikes and the level of freedom because of the dockless service.

Inhabitants of Delft
Students
49% of respondents live in Delft of which 75% are students; they can generally be classified as casual Mobike users. 23% uses Mobike at least once a week in contrast to 37% once every 1-3 months and 40% between one and three times a year. For the 77% casual users, their main reason to use Mobike is as a temporary replacement for their own bike; this could either be when their bike is broken or for one-way trips when their bike is parked somewhere else. For the other 23% who uses Mobike regularly, convenience is the primary motivator.

Working people
Of the people whom identified themselves as employed and living in Delft (25% of respondents living in Delft and 12% of total respondents), most are regular Mobike users, using a Mobike at least every week and a few use Mobike as a temporary replacement for their own bike.

Tourists
Only 4 tourists (which accounts for 5% of the samples) have responded to the survey. Based on this small group, no real conclusion could be drawn about their motivation to use Mobike.

7. Conclusion, discussion and recommendations

In this chapter, the main research question of this thesis is answered: *How does dockless bike-sharing influence sustainable mobility in Delft?*. Paragraph 7.2 discusses the results of this thesis in general and the methodology used. In paragraph 7.3 suggestions for further research are given.

7.1. Conclusion

Based on gained knowledge with the literature study and the results of the user survey, it follows that Mobike is used in Delft for short trips (2 km). On average 15 trips per day are made per 1000 residents of Mobike's service area in Delft. 76% of Mobike users are students, and in general, users are highly educated. Many trips have their origin or destination at the railway stations and the TU Delft campus. Half of the Mobike users also have their own bike at disposal in Delft, and half of the respondents live in Delft, with these two things closely linked.

Mobikes are used by a variety of users with different motives. Most commuters use Mobike regularly, i.e. every (week)day and there are occasional users. For the commuter, 'convenience' is most often named as people's main reason to use Mobike. Convenience includes accessibility of the bikes, user-friendliness of the app, payment method, the fact that they can park the bike everywhere and not being responsible for the bike after it is locked. Most of the casual or occasional users live in Delft and own a bike. Their main motivator to use Mobike is as a temporary replacement for their own bike if it is broken, or one-way trips when their bike is located somewhere else. Finally, the third type of users are tourists. Expected is that their trip characteristics and reasons may differ from other users, but this cannot be derived based on this research.

Although the users' exact motives and frequency of use may differ, there is one clear outcome regarding the alternative transport mode. 72% of the respondents of the survey indicated that if Mobike would not be available, they would walk or cycle with their own bike/OV-fiets to their destination. Besides, 26% would take the tram or bus. Together, this demonstrates that almost everyone uses Mobike as an alternative to other sustainable transport modes. To conclude, Mobike as a dockless bike-sharing program in Delft does not influence the share of sustainable transport modes in Delft.

7.2. Discussion

Since the execution of the survey itself is already discussed in paragraph 6.2, this paragraph focusses firstly on the literature review and links this with the results obtained. Secondly, the (survey) results are compared with other researches.

Literature review

For the literature review chapter, many peer-reviewed papers are looked at and a lot of the information found is included in the presented overview of influencing factors. Nonetheless, it cannot be said with certainty that there is no factor, that influences the use of shared-bikes, lacking from the overview provided. Only Ricci's (2015) literature review, which partly focussed on addressing the determinants and barriers to bike-sharing, is found to validate the completeness.

Comparison literature and information from face-to-face interviews

When conducting the face-to-face interviews, several people explained that they are using a Mobike because they had previously experienced bicycle theft and liked the concept of Mobike because after the bike is locked, they are not responsible for it anymore. This is in line with the strongly influencing factor of bicycle theft on shared-bike use as found in literature. Avoiding bicycle theft is one of the convenience reasons in the survey. Secondly, most of the interviewees, mostly commuters, at the station said they use a Mobike only on working days. Along with data of Mobike trips on various days in Delft, this supports the literature review findings concerning the fact that shared-bikes are more often used on weekdays than weekend days. Another

interesting explanation Mobike users gave is that until a few weeks ago they usually took the bus to the TU campus, but now that the 'Sint Sebastiaansbrug' (a bridge connecting the city centre and TU campus) is under construction, they prefer a Mobike because the saving of time considering the bus has to take a detour. The obstruction of the bus route between Delft railway station and the TU campus is comparable to the situation of a public transport strike as discussed in the literature chapter and is said to have a positive influence on the usage of shared-bikes.

Comparison of other cities and shared-bike programs
The main findings from research on dock-less shared-bikes in Amsterdam are: FlickBike is used mostly by young, highly educated, working men. The majority of users live in Amsterdam. FlickBikes are mainly used for private trip purposes and is primarily an alternative for public transport and walking (Van Waes et al., cx. The similarities of the researches are that Mobike Delft users are mainly young, highly educated working men and Mobike is partly used as an alternative for transport and walking. However, the trip purpose and the origins of users are not in accordance. Furthermore, this research on Mobikes in Delft is quite in line with international studies from bike-sharing programs in Barcelona, Montreal, Paris and Lyon, confirming that the vast majority (between 83 and 91%) of trips on shared-bikes replace other sustainable transport modes (Bachand-Marleau, Larsen, & El-Geneidy, 2011; Midgley, 2011). Midgley (2011) and Mátrai & Tóth (2016) also confirm that since cycling distances generally are within 1 to 5 km range and most people are willing to walk up to 10 minutes, bike-sharing is a competing mode of both walking and cycling on a private bike. Additionally, the results indicating a high percentage of young males, aged between 18 and 24, and university educated that use Mobike corresponds with other researches on user's profiles (Ricci, 2015).

7.3. Recommendations
This paragraph gives suggestions for further research. Practicalities as well as increasing scientific reliability.

Practical
For even more reliable results, the number of responses should be enlarged to increase the confidence level as discussed in paragraph 6.2 Discussion. In that case, it would be possible to specify further the user's motivation to use Mobike by various types of users based on their demographics or trip purposes. Enlarging the responses is feasible by a better collaboration with Mobike Netherlands and investing more time (and money). Mobike Netherlands was aware of this research and is also interested in the survey results, but still does not allow flyers to be attached to the bicycles. Also spreading the survey in the app could potentially get more reactions. By investing more time, it is possible to conduct more face-to-face interviews and thus enlarge the sample size. Moreover, next time it would be practical to separate the incoming reactions of the different survey methods to possibly identify differences and to be better able to determine the response rate. Furthermore, the survey is limited to multiple choice questions, but next time it could be interesting to assign weighting factors to choices, for example, users' motives. This could lead to an even better or reliable distinction between the different type of bike-sharing users.

Scientific
For scientific research, it would be interesting to repeat the survey on different bike-sharing systems in other cities in the Netherlands and worldwide in order to compare the results and find discrepancies. It would be interesting to find out if shared-bikes are used differently throughout the world and why that would be.
Furthermore, conducting a reverse survey (targeting non-Mobike users to question why they do not use a Mobike or ex-users why they do not use Mobike anymore) could also give interesting insights in for example the barriers for using a shared-bikes and could validate the results obtained in this research. With more knowledge on people's perspectives about shared-bikes, its usage could be stimulated by policies exactly aiming at peoples wishes and needs.

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Appendix 1

Google Forms survey

Mobikes in Delft

Voor mijn afstudeeronderzoek naar deelfietsen (Mobikes) in Delft worden alle Mobike gebruikers in Delft uitgenodigd om een enquete in te vullen. De online vragenlijst bestaat uit 13 vragen over uw redenen voor het gebruik van een Mobike. Het invullen duurt maximaal 3 minuten. Deelname aan het onderzoek is volledig anoniem.
Alvast bedankt voor uw deelname.

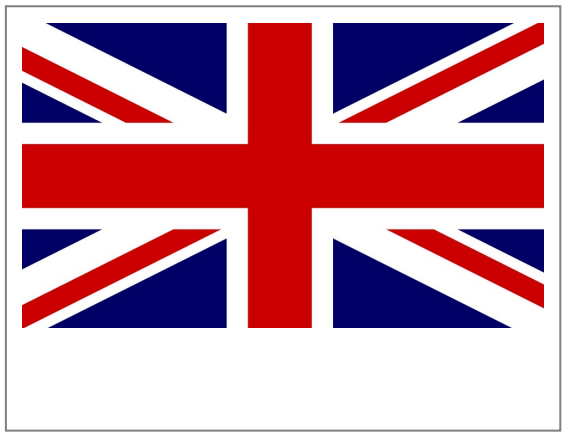
Met vriendelijke groet,
Iris van Gerrevink
Student Civiele Techniek aan de TU Delft

For my bachelor thesis I am researching bike-sharing (Mobikes) in Delft. I would like to invite every Mobike-user in Delft to participate in this survey. The online survey contains 13 questions on your reasons for choosing Mobike. The survey will not take more than 3 minutes. Participation is completely anonymous.
Thanks in advance.

Kind regards,
Iris van Gerrevink
Student Civil Engineering at Delft University of Technology

*Vereist

1. **Dutch or English?** *
   Markeer slechts één ovaal.



◯ Nederlands *Ga naar vraag 2.* ◯ English *Ga naar vraag 3.*

Nederlands

2. **Gebruik je wel eens een Mobike/ Heb je ooit een Mobike gebruikt in Delft?** *
   Markeer slechts één ovaal.

◯ Ja *Ga naar vraag 4.*
◯ Nee *Stop met het invullen van dit formulier.*

English

3. **Do you use / Have you ever used a Mobike in Delft** *
Markeer slechts één ovaal.

- ◯ Yes *Ga naar vraag 18.*
- ◯ No *Stop met het invullen van dit formulier.*

Nederlands

Vragenlijst

4. **Hoe vaak gebruik je een Mobike in Delft?** *
Markeer slechts één ovaal.

- ◯ Voor (bijna) iedere fietstrip
- ◯ Iedere dag
- ◯ Iedere week
- ◯ Eens in de 2-3 weken
- ◯ Iedere maand
- ◯ Eens in de 2-3 maanden
- ◯ Eens in de 4-6 maanden
- ◯ Eén of twee keer per jaar

5. **Wanneer was uw laatste trip met een Mobike in Delft?** *
De volgende vragen hebben betrekking tot uw laatst gemaakte trip
Markeer slechts één ovaal.

- ◯ Vandaag
- ◯ Gisteren
- ◯ 2 dagen geleden
- ◯ Eerder deze week
- ◯ Langer geleden

6. **Wat is het hoofdmotief van uw laatste Mobike trip?** *
Markeer slechts één ovaal.

- ◯ Werk
- ◯ Onderwijs
- ◯ Winkelen
- ◯ Vrije tijd
- ◯ Anders: _____

7. **Heeft u een (eigen) fiets ter beschikking in Delft?** *
Markeer slechts één ovaal.

- ◯ Ja
- ◯ Nee

8. **Welk vervoermiddel had u gebruikt als Mobike niet beschikbaar zou zijn?** *
Markeer slechts één ovaal.

- ◯ Lopen
- ◯ Eigen fiets/Swapfiets
- ◯ OV-fiets
- ◯ Eigen auto
- ◯ Deel auto
- ◯ Bus, tram
- ◯ Trein
- ◯ Taxi
- ◯ Anders: _____

9. **Wat zijn uw hoofdredenen voor het gebruiken van een Mobike?** *
Markeer slechts één ovaal.

- ◯ Snelste alternatief in vergelijking met andere vervoersmiddelen
- ◯ Goedkoopste alternatief in vergelijking met andere vervoersmiddelen
- ◯ Meest gemakkelijk in vergelijking met andere vervoersmiddelen
- ◯ Voorkeur om te fietsen vanwege milieuredenen
- ◯ Voorkeur om te fietsen vanwege het huidige weer
- ◯ Voorkeur om te fietsen vanwege gezondheidsredenen
- ◯ Tijdelijke vervanging voor eigen fiets
- ◯ (Bijna) allemaal
- ◯ Anders: _____

10. **De 'OV-fiets' is een ander deelfietsen programma, waarom kiest u ervoor om een Mobike te gebruiken en geen OV-fiets?** *
Markeer slechts één ovaal.

- ◯ Betere kwaliteit van de fietsen, comfortabeler
- ◯ Betere beschikbaarheid van de fietsen
- ◯ Gemak van overal parkeren zonder vaste stallingsplaatsen
- ◯ Gemak van de app, betalingsmethode en/of ontgrendelen van de fiets
- ◯ Goedkoper
- ◯ Ik geef niet per se de voorkeur aan Mobike boven OV-fiets
- ◯ Ik weet het niet
- ◯ Ik heb geen OV-fiets abbonement
- ◯ Anders: _____

11. **Wilt u nog meer vragen beantwoorden?** *
Bedankt! Dit is in principe het einde van de vragenlijst. Maar het zou heel fijn zijn als u bereid bent ook nog 5 vragen over uzelf te beantwoorden.
Markeer slechts één ovaal.

- ◯ Ja *Ga naar vraag 12.*
- ◯ Nee *Stop met het invullen van dit formulier.*

Nederlands (vervolg)

12. **Wat is uw leeftijd?** *
Markeer slechts één ovaal.

- Onder 18
- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 64
- 65+

13. **Wat is uw geslacht?** *
Markeer slechts één ovaal.

- Man
- Vrouw
- Wil ik liever niet zeggen

14. **Wat is uw hoogst afgeronde of huidige opleidingsniveau?** *
Markeer slechts één ovaal.

- Basisschool
- Middelbare school
- MBO
- HBO
- WO

15. **Welk van de volgende beschrijft uw werksituatie het beste?** *
Markeer slechts één ovaal.

- Werkzaam
- Werkeloos/Op zoek naar werk
- Huisman/vrouw
- Student
- Gepensioneerd
- Anders: _____

16. **Wat is uw relatie met Delft?** *
Markeer slechts één ovaal.

- Inwoner van Delft
- Studeren/werken in Delft maar woonachtig buiten Delft
- Toerist in Delft, woonachtig in Nederland
- Toerist in Delft, woonachtig buiten Nederland

17. **Vind u dit een interessant onderzoek en bent u bereid mee te doen aan een diepte-interview? Laat uw contactgegevens hier achter en ik zal u misschien binnenkort contacteren.**

_____

_____

_____

_____

_____

Stop met het invullen van dit formulier.

English

18. **How frequently do you use a Mobike in Delft?** *
Markeer slechts één ovaal.

- ◯ For (almost) every cycling trip
- ◯ Everyday
- ◯ Every week
- ◯ Every 2-3 weeks
- ◯ Every month
- ◯ Every 2-3 months
- ◯ Every 4-6 months
- ◯ Once or twice a year

19. **When was your last trip with a Mobike in Delft?** *
The following questions are referring to that trip
Markeer slechts één ovaal.

- ◯ Today
- ◯ Yesterday
- ◯ 2 days ago
- ◯ Earlier this week
- ◯ Longer ago

20. **What is your main purpose of your last Mobike trip?** *
Markeer slechts één ovaal.

- ◯ Work
- ◯ Education
- ◯ Shopping
- ◯ Social/recreation
- ◯ Anders: _____

21. **Do you have an (own) bike at your disposal in Delft?** *
Markeer slechts één ovaal.

- ◯ Yes
- ◯ No

22. **How would you have travelled if Mobike was not available?** *
Markeer slechts één ovaal.

- Walking
- Own bicycle/Swapfiets
- OV-fiets
- Own car
- Shared-car
- Bus, tram
- Train
- Taxi
- Anders: _____

23. **What are your main reasons for using a Mobike?** *
Markeer slechts één ovaal.

- Fastest alternative in comparison to other travel modes
- Cheapest alternative in comparison to other travel modes
- Most convenient alternative in comparison to other travel modes
- Prefer to cycle for environmental reasons
- Prefer to cycle because the weather is suitable
- Prefer to cycle for health reasons
- Temporal replacement for own bike
- All of the above
- Anders: _____

24. **'OV-fiets' is another shared-bicycle program, why do you prefer to use a Mobike?** *
Markeer slechts één ovaal.

- Better quality of bikes, more comfortable
- Better availability of bikes
- Dockless-service, no fixed pick-up and drop-off locations
- Convience of the app, payment method and/or unlocking the bike
- Cheaper
- I do not have an OV-fiets subscription
- I do not prefer Mobike over OV-fiets
- I do not know
- Anders: _____

25. **Would you like to proceed?** *
Thank you, this is the end of the survey. However, you would help me a lot if you could also answer 5 more questions about yourself.
Markeer slechts één ovaal.

- Yes *Ga naar vraag 26.*
- No *Stop met het invullen van dit formulier.*

English (follow-up)

26. **What is your age?** *
Markeer slechts één ovaal.

- ◯ Under 18
- ◯ 18 - 24
- ◯ 25 - 34
- ◯ 35 - 44
- ◯ 45 - 54
- ◯ 55 - 64
- ◯ 65+

27. **What is your gender?** *
Markeer slechts één ovaal.

- ◯ Male
- ◯ Female
- ◯ Prefer not to say

28. **What is the highest level of education you have completed or currently enrolled in?** *
Markeer slechts één ovaal.

- ◯ Primary school
- ◯ High school
- ◯ MBO
- ◯ HBO
- ◯ University (WO)

29. **Are you currenlty..?** *
Markeer slechts één ovaal.

- ◯ Employed
- ◯ Out of work/Looking for work
- ◯ A homemaker
- ◯ A student
- ◯ Retired
- ◯ Anders: _____

30. **What is you relation with Delft?** *
Markeer slechts één ovaal.

- ◯ Living in Delft
- ◯ Studying/working in Delft, living outside of Delft
- ◯ Tourist in Delft, living in the Netherlands
- ◯ Tourist in Delft, living outside of the Netherlands

31. **Do you think this is an interesting research and would you like to contribute even more? Leave your contact details below and I will possibly contact you for a more in-depth interview.**

Appendix 2

The flyers are printed in A6-size.

Appendix 3

Demographics

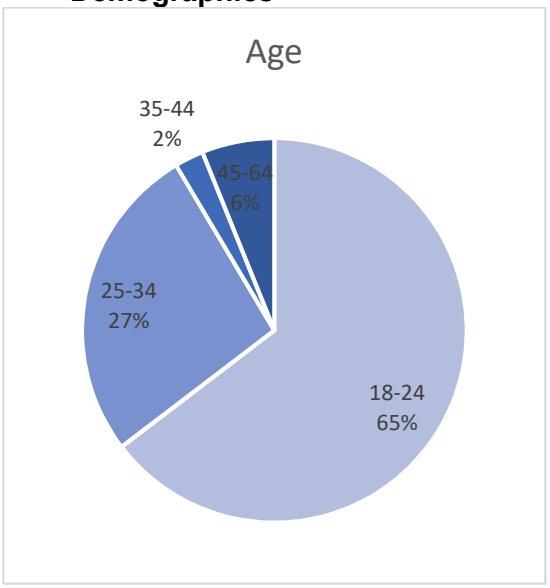


Figure 18: Age distribution Mobike users

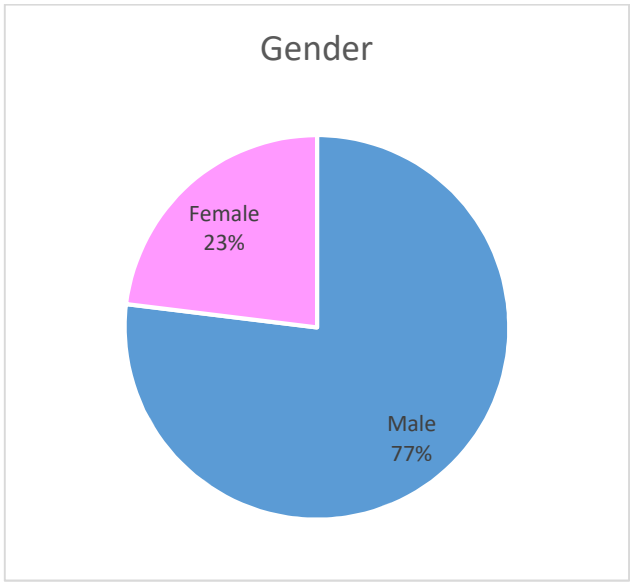


Figure 19: Gender distribution Mobike users

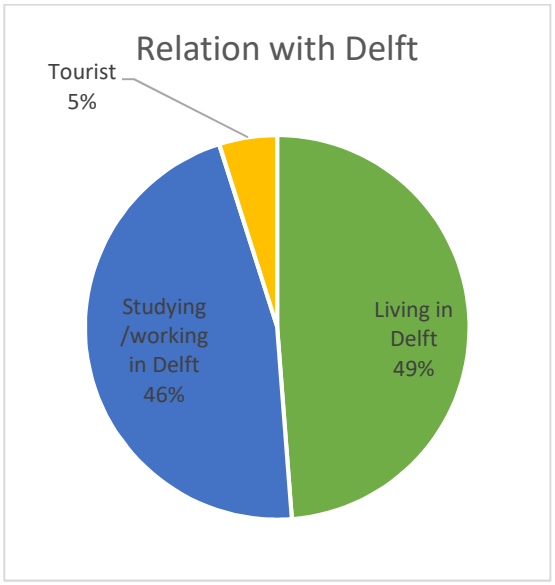


Figure 20: Inhabitants and commuters distribution of Mobike users

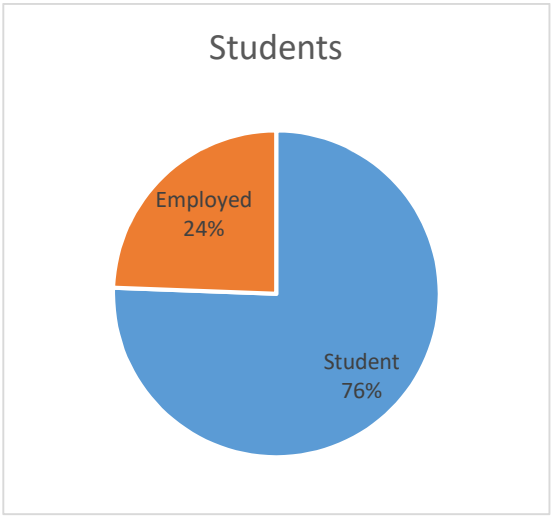


Figure 21: Students/working distribution of Mobike users

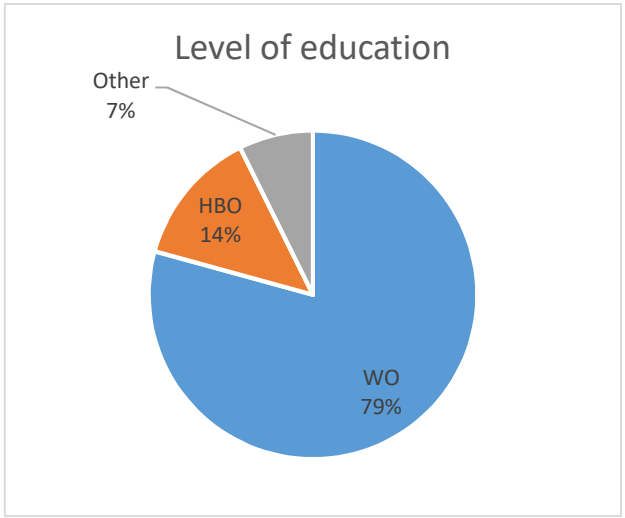


Figure 22: Level of education of Mobike users

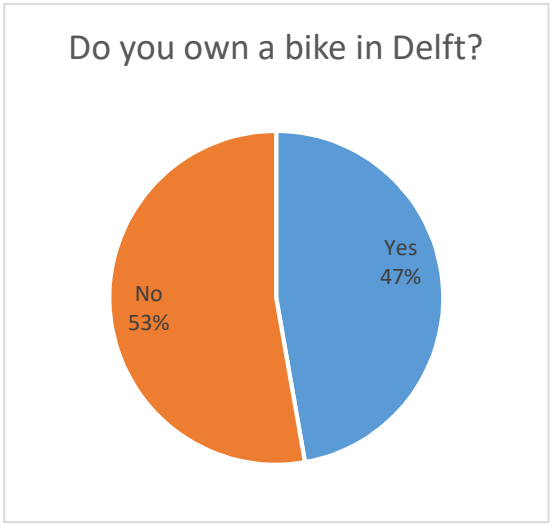


Figure 23: Mobike users with private bike

Survey question results

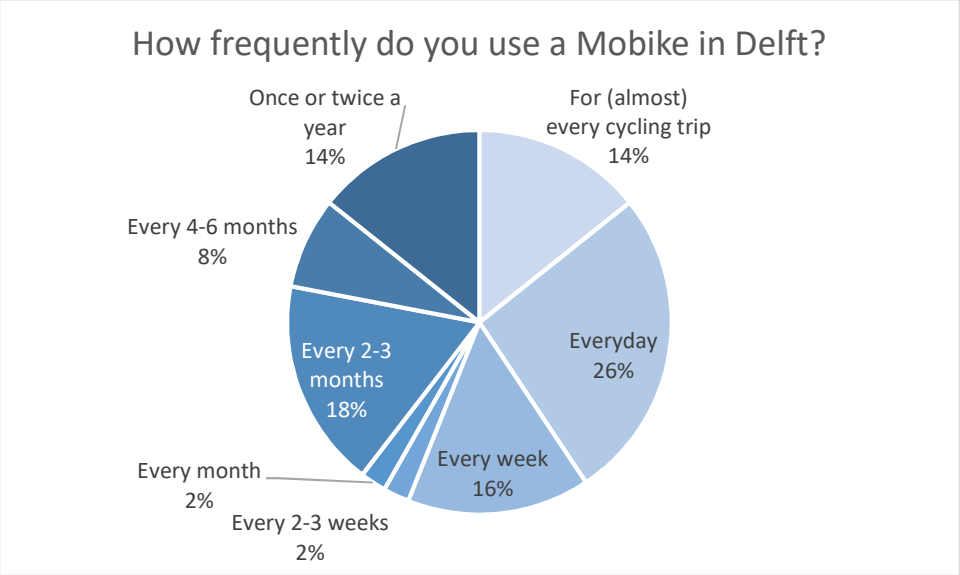


Figure 24: Frequency of Mobike use

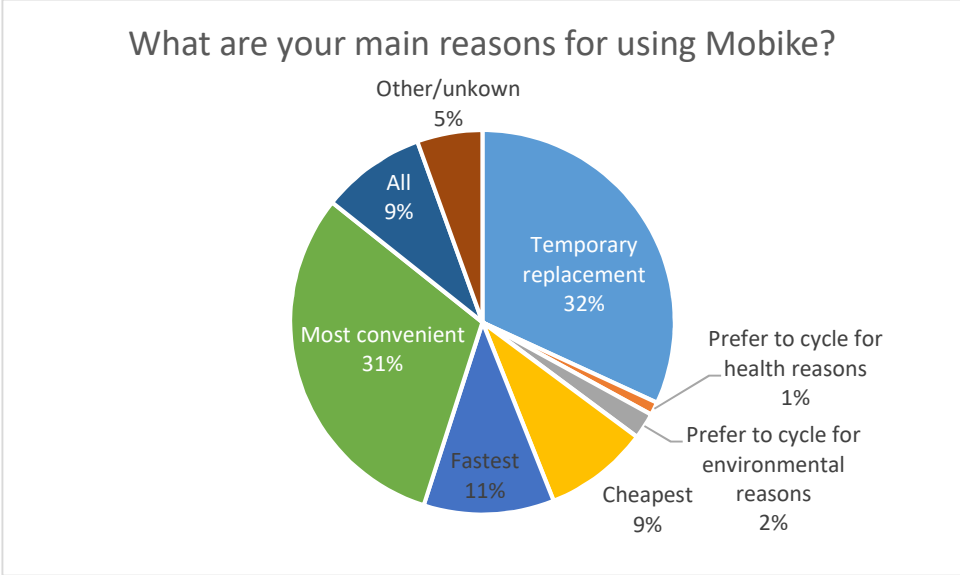


Figure 25: Main reasons for Mobike use

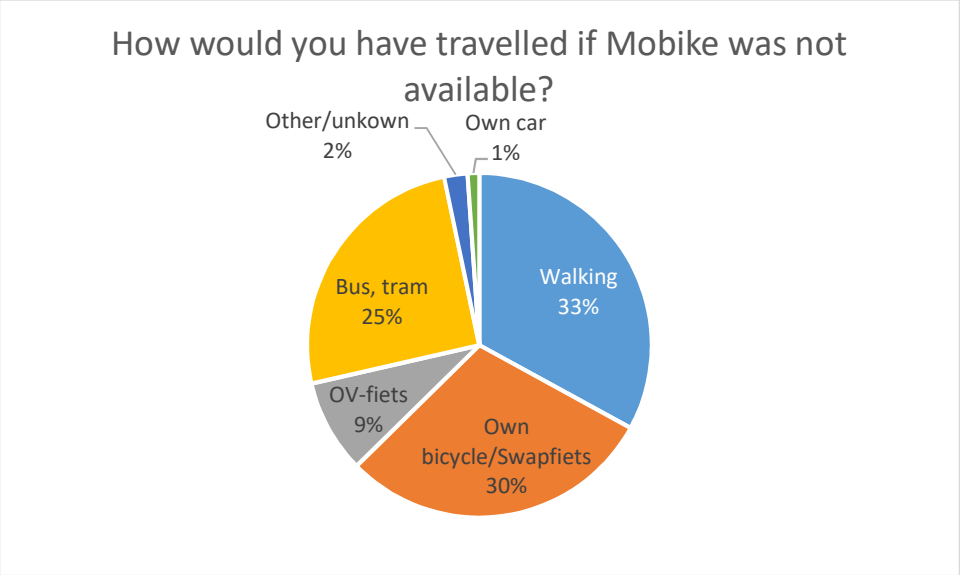


Figure 26: Alternative travel modes for Mobike trip

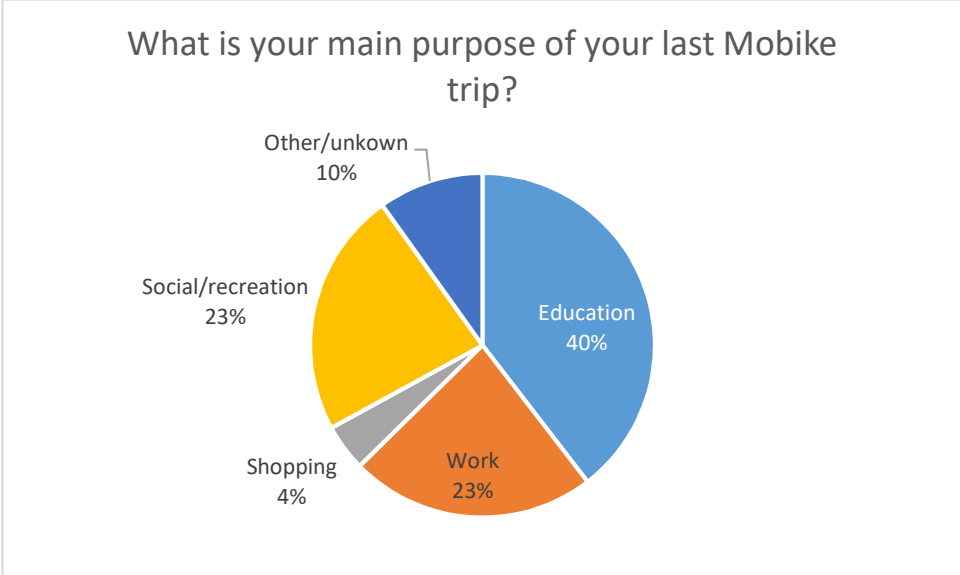


Figure 27: Main purpose of Mobike trip

Combination of results from survey questions

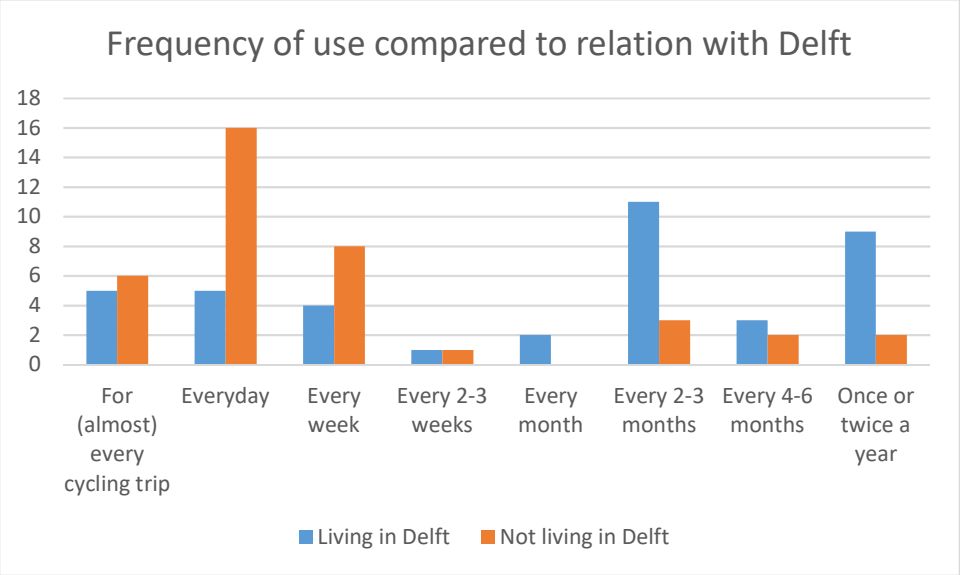


Figure 28: Inhabitants/commuters and frequency of Mobike use

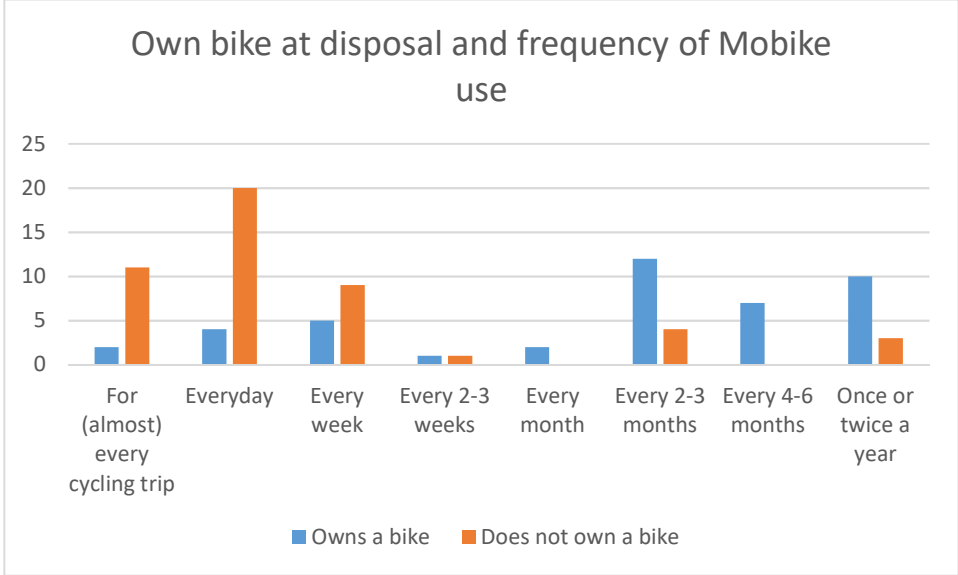


Figure 29: Private bike and frequency of Mobike use

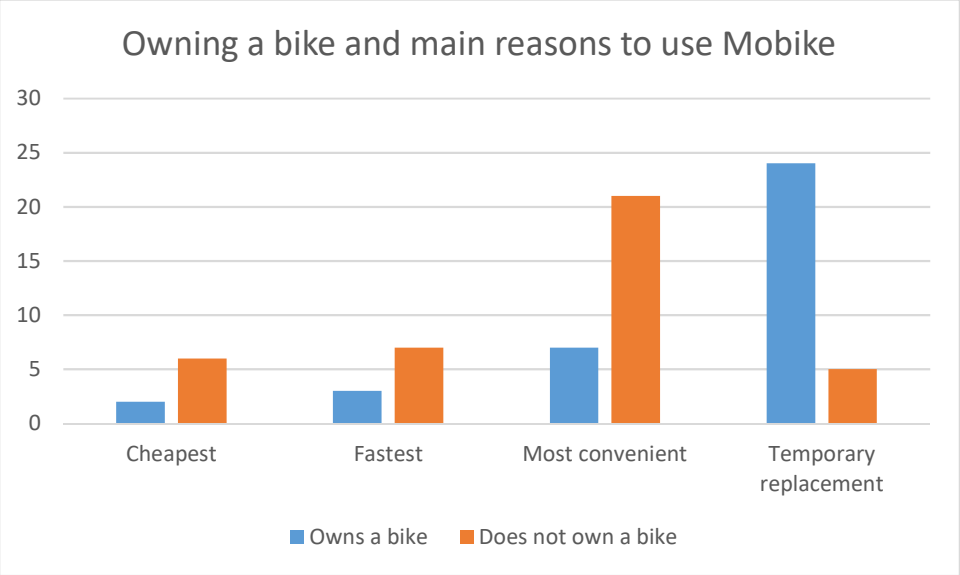


Figure 30: Private bike and main reasons for using Mobike

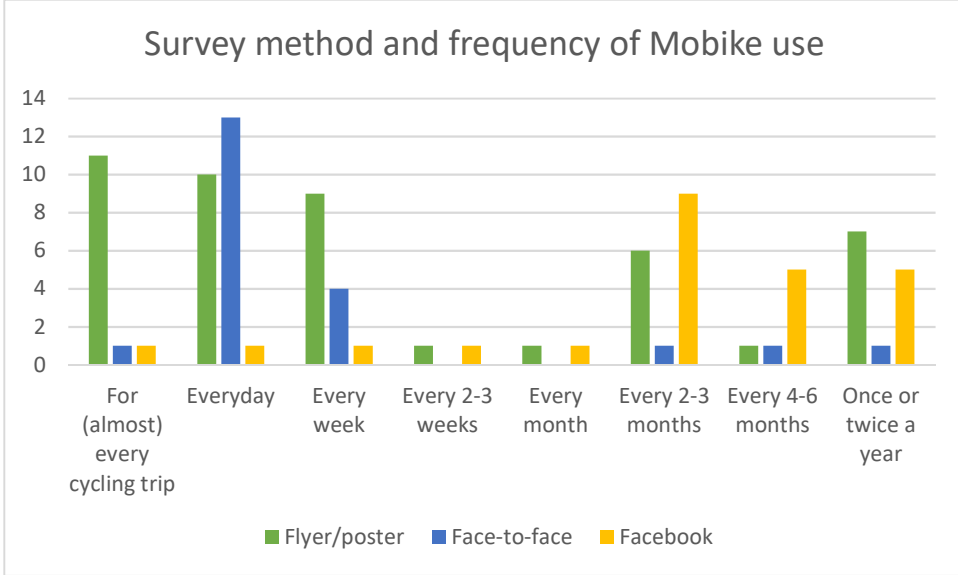


Figure 31: Survey method and frequency of Mobike use

Language

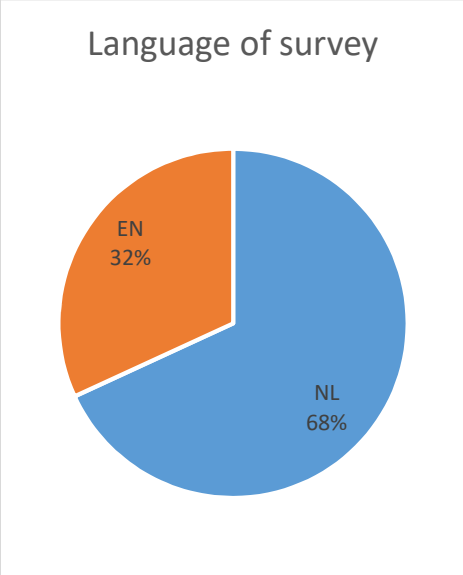


Figure 32: Language of survey

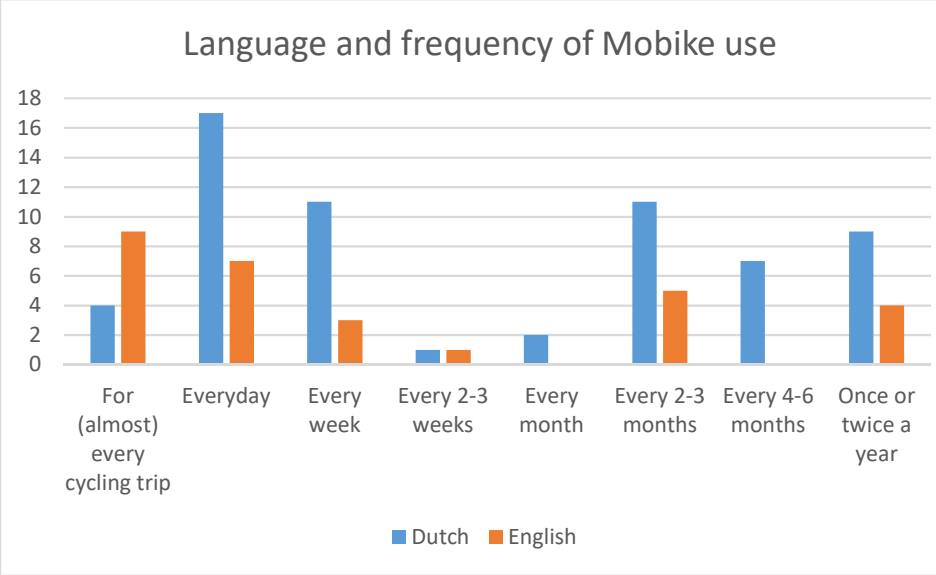


Figure 33: Language of survey and frequency of Mobike use

Characterisation of students and non-students, and bike or no bike, living in Delft
Total: 78 results (excluding tourists and people who did not complete the demographic section of the survey)

	Living in Delft	Not living in Delft
Student	30	28
Employed	10	10
Total	**40**	**38**

Table 3: Overview respondents students vs. employed and inhabitant of Delft or not

	Employed and living in Delft
Regular Mobike users	8
Casual Mobike users	2
Total	**10**

Table 4: Proportion casual and regular Mobike users of respondent that are employed and living in Delft

	Students living in Delft	
At least every week	7	**23%**
Once every 1-3 months	11	**37%**
1-3 times a year	12	**40%**
Total	**30**	**100%**

Table 5: Overview frequency of Mobike use of students living in Delft

	Living in Delft	Not living in Delft
No own bike	9	33
Own bike	31	5

Table 6: Overview bike vs. no bike and inhabitant of Delft or not