

Evaluation report

Wayfinding pilot. Information provision
City of Zwolle

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Short description

The city centre of Zwolle is becoming increasingly crowded with parked bicycles. The government wants to attract more cyclists to the city centre but they do not want them to park their bicycles in public space. They want them to use the bicycle parking facilities with sufficient free spaces. The Wayfinding pilot aims at supporting the use of these facilities. On three city entrances, adaptive signs will be placed that are controlled by data from the counting sensors in the bike storages. On these signs, cyclists will be able to read which parking facilities are suggested for them since these have enough free places.

FIGURE 1: PHOTO OF THE ADAPTIVE SIGN AT ONE CITY ENTRANCE



Source: Mobycon

Type of ITS

Interactive signs

Timeline

The system was installed in the beginning of 2022. First some weeks were needed to solve technical issues. The full system was launched in March 2022. After some weeks in full operation, a survey has been administered to address how users experienced the system. The measurements by the different counting sensors have been performed during 11 weeks between the 1st of March 2022 to 23rd of May 2022, except 15th March to 22nd March (when a disruption occurred).

Hypothesis

The hypothesis is that when people know better where to park their bicycles, they will use their bicycles more often. This will increase bicycle traffic and will reduce the usage of cars and subsequently the CO₂ emissions in the city centre.

Data sources

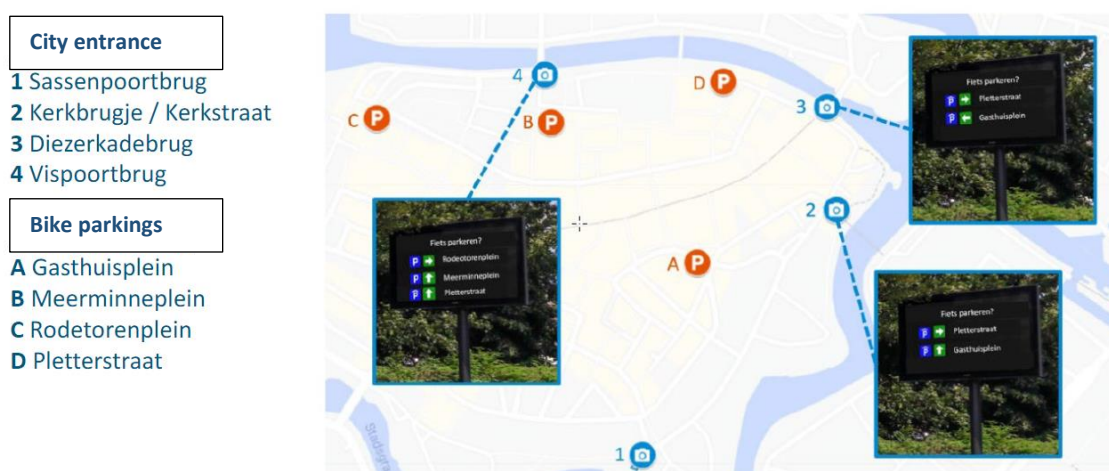
- User experiences via a survey¹
- .Occupancy rates of parking facilities before the launch of the system²
- Data of camera system on amount of bicycle parking facilities and number of cyclists in the city³

Analysis

Report of the pilot

The objective of the pilot is that cyclists in the city of Zwolle more efficiently use the parking capacity for bicycles and that the number of parked bicycles in public space are reduced. Therefore they inform cyclists at four entries in the city where they can store their bike.

FIGURE 2: MAP SHOWING WHERE ADAPTIVE SIGNS ARE PLACED



Source: Mobycon

The counting of the free parking spaces is performed by cameras using image recognition software that is trained to recognise bikes. The software uses virtual counting lines to count the number of bikes. The

¹ Discussion based on a memo "Globale verwerking survey fietsverwijssysteem" written by Mobycon on the 20th of October 2022.

² Discussion based on a presentation « Inzicht in beweging van fietsers in Zwolle » written by Samir el Gamal of Royal HasKoning DHV.

³ Idem

camera images are not recorded because of privacy issues. The referral signs include only information on parking spaces that are guarded. For each of the four storing places the signs indicate whether the parking has some free places or is fully booked. The latter situation is indicated when 85% of the theoretical capacity is reached.

FIGURE 3: CLOSE UP ADAPTIVE SIGN



Source: Mobycon

User experiences via a survey

In the city centre of Zwolle a survey has been administered among the users of some of the bicycle storages. The objective is gathering data on the appreciation of the digital referral systems. Overall 307 respondents participated to the survey. Remarkably, a large majority of the people interviewed answered that they did not make use of the signs. Indeed, only 15% of the respondents mentioned that they noticed the signs. Among these respondents moreover only half of the people actually use the information on the signs to make a choice where to stall their bike. Only 3 people always follow the indicated information, 5 people do it most of the time and 13 sometimes use the information.

More than half of the 307 respondents are not convinced that the current referral system has an added value. Some argue that it could have an added value when it is upscaled and would include more bicycle storing places.

96% of the respondents say that the signs do not support their choice to use the bike as a means of transport. This means that only for a tiny minority of 4% the referral system has been an extra motivation to cycle more. Indeed, only 7 people explicitly indicate they start cycling new routes in the city and therefore they cycle more frequently because of the referral system. 2 of these people now use the bike where they previously took their car. The other two respondents start using the bike instead of travelling by public transport

20% of the respondents indicate that changes must be made to the signs in order for them to be more useful. Many comments are about the visibility of the signs. They should stand out more, for example by

the color. They should be in a more visible place. There should be more signs and they should be clearer and closer to the bicycle parking.

If they were to choose between two different referral systems, 74% would choose for an automatic camera registration system (as in the current pilot) while only 26% would opt for the scanning of labels. When they are asked why they make their choice, most argue that an automatic system is more practical. Some refer to privacy issues when cameras are used.

Data produced by camera system on number of bicycle parking facilities and number of cyclists in the city

The measurement period has been for 11 weeks: 1st March 2022 to 23rd May 2022, except 15th March to 22nd March (disruption). Two different types of counting sensors are used to generate data. A first one is counting sensors at the city entrances. These sensors count 90-95% of all passing cyclists. The deviations mainly occur when several cyclists cycle together. This first type of counting sensors monitors the bicycle flows (towards the city centre) at four entrances to the city centre (Sassenpoortbrug, Kerkbrugje, Vispoortbrug, Diezerkadebrug).

A second one is sensors installed at the monitored parking facilities (except Gasthuisplein). They count 90-95% of all bicycles under ideal conditions. However, this percentage is not achieved if queues arise at the entrance of the parking facility. At Gasthuisplein parking, it has not been possible to realize a good measuring set-up. Presumably the limited ceiling height in combination with the limited space for positioning the counter are the cause of this. This second type of sensor thus allows to measure the occupancy rate of the guarded parking facilities (number of occupied places compared to total availability) for Rodetorenplein, Meerminneplein and Pletterstraat. The sensors quantify the average number of stallers (inflow) per hour and per day of the week.

Comparing the data of both types of counting sensors one can measure the effectiveness of the referral system. Indeed, they allow to address the question to what extent the traffic flows adapt based on the instructions on the information sign.

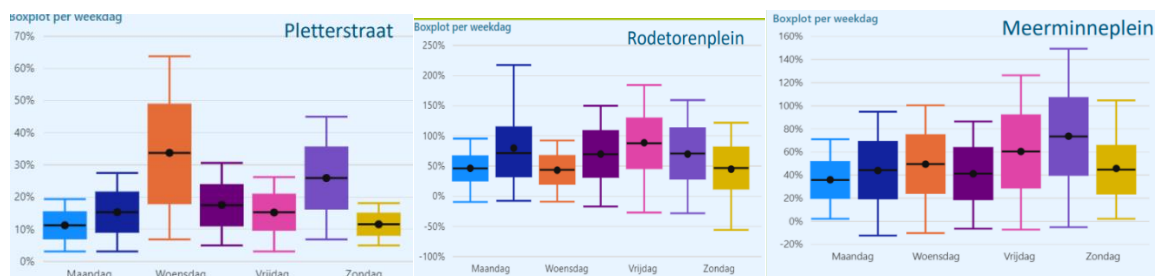
Measuring the occupancy rate: differences between storage places and across the days of the week

The data show that the occupancy rate at the Pletterstraat remains well below the maximum occupancy rate during the 11 weeks of measurement, the exception is Wednesday 27 April (which is King's Day in the Netherlands). The Meerminneplein and Rodetorenplein on the contrary regularly have an occupancy rate that exceeds 100% and occasionally a rate that appears to be lower than 0%. These results are partly imperfections in the measurement system (imbalance between inflow and outflow or large outflow after daily reset moment).

In the first graph beneath the occupancy rate per weekday is shown at the Meerminneplein, the Rodetorenplein and the Pletterstraat. Due to the limited measurement period (11 weeks). A few outliers can be noted, e.g. due to the exceptional crowds on Wednesday 27 April (King's Day). The Pletterstraat has

a high average occupancy rate on Wednesday. Friday and Saturday are (as expected) the busiest days. In the second graph the average inflow for a Saturday per storage facility is shown.

FIGURE 4: THE AVERAGE OCCUPANCY RATE PER DAY OF THE WEEK FOR THE THREE STORAGE PLACES



Source: Royal HasKoning DHV

FIGURE 5: THE AVERAGE INFLOW OF CYCLISTS ON A SATURDAY AT THE THREE STORAGE PLACES



Source: Royal HasKoning DHV

Measuring the bicycle flow: counting cyclists passing by at four entrances to the city centre

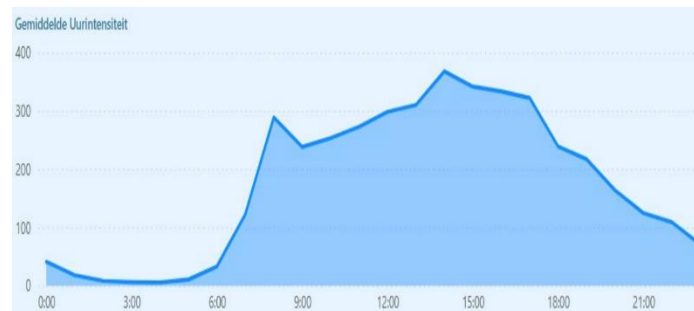
In the table below we find at the right-hand side the numbers of cyclists passing by at the 4 city entrances over the entire measurement period (11 weeks). In the graph below the average number of cyclists passing at different moments of the day is shown. The average number is calculated by aggregating both the measurements at the different city entrances and the counting for the five weekdays (mon.-fri.) registered during the 11 weeks between 1st of March and the 23rd of May.

FIGURE 6: THE NUMBER OF CYCLISTS PASSING BY IN THE 11 WEEKS OF MEASUREMENT

Locatie	Instroom tot	Instroom %
Sassenpoortbrug	408097	32,54%
Diezerkadebrug	381201	30,40%
Kerkbrugje / Kerkstraat	293177	23,38%
Vispoortbrug	171522	13,68%
Totaal	1253997	100,00%

Source: Royal HasKoning DHV

FIGURE 7: AVERAGE NUMBER OF INFLOW AT DIFFERENT TIMES OF THE DAY (INFORMATION ON ALL FOUR LOCATIONS TAKEN TOGETHER)



Source: Royal HasKoning DHV

In order to analyse the effectiveness of the referral system, Royal HasKoning DHV looked into the data at (1) a change in route choice at the referral boards. If the referral system is efficient, we would expect to see more cyclists choosing the direction of a free parking facility. They also looked at whether there is (2) a change in inflow at the other parking facilities. If the referral system is efficient, we would expect to see an increase in inflow at the non-full parking facilities to which reference is made.

The data do not confirm the efficiency of the referral system. Indeed, when comparing the data of the counting lines at the time periods that a storage facility was full for more than an hour with the reference data (same day and time period but when the storage facility was not full) it shows that the fluctuations in numbers per direction is not significantly different. The same is true when comparing for these time periods the inflow numbers of the other storage(s) with the reference dates (same day and time period when the storage was not full). The analyses show that the fluctuations in the inflow of the other storages fall within the variation that already occurs at times when none of the storages is full.

The number of cyclists towards the city centre is many times greater than the number of guarded parking spaces. Apparently only a very small number of cyclists are on their way to a guarded parking. Without knowing which cyclists they are, the effect on their choice of route cannot be determined.

What works, what does not work?

- The possible effect of the information on the digital signs on the choice cyclists make to deviate from their route cannot be seen in the data. This is partly because the share of "cyclists with the intention to park in a guarded parking garage" is very small as compared to the total number of passing cyclists. Our estimate is that this share is less than 5%.
- Image recognition works well with a "free flow", but when queues arise, the accuracy decreases.
- The measured occupancies of the Meerminneplein and Rodetorenplein storages indicate >100% on busy days. It seems that counting the outflow on busy days does not always go well. This means that the signs could indicate that the storage is full, whereas the manager would conclude that there is still parking capacity left.

Recommendations as formulated by Royal HasKoning DHV

- Take measures to prevent queues around the counter
- Further validation of the outflow numbers on busy days for Meerminneplein and Rodetorenplein 85% FULL threshold determine by means of the practical storage capacity (instead of the theoretical capacity). This means two things.
 1. Adjusting the capacity of the storage facility in the system. The theoretical capacity of the storage facility has now been taken into account. In practice, this appears to be lower due to larger (cargo) bicycles, incorrectly parked bicycles, etc.
 2. Perform validation to test the reliability/accuracy of the cameras. This can be done by performing a manual validation at various times. This can be done on location but also by looking closely what is registered by the counting cameras.
- Investigate the effect of the information signs by means of a survey among the users of the guarded storage Stalling Gasthuisplein:
 1. Investigate other methods to count bicycles (e.g. only tagging and unlocking that data)
 2. Investigate whether a top view camera can be trained to accurately count bicycles by means of image recognition.

Conclusions

The results of the Wayfinding pilot have not been convincing. The survey among users of the parking facilities showed that a large majority did not notice the signs. The minority that did notice the signs says that the information did not influence their choice concerning the parking facilities. The analyses by Royal HasKoning DHV of the data administered by the counting sensors does not allow to support the efficiency of the pilot either. The data do not show a different pattern of inflow at the parking facilities following the information on the digital signs. However, this does not mean that a referral system cannot support an efficient use of parking facilities. The survey administered among the users resulted in information about the changes that could support the added value of a referral system. First and foremost the visibility of the signs should be enhanced. In order for the pilot to generate an impact on cyclist behavior, the signs must be noticed. There should be more signs, the respondents argue. They should moreover be better located, closer to the parking facilities, they should be in brighter colors to support their visibility and information on more parking facilities should be included to really make a difference. A remark by the project managers concerns the integration of this type of information in for example the Schwung app (another pilot in the city of Zwolle). Indeed, merging information on parking facilities in an app addresses various remarks made by the users. It would make the information much more accessible, visible and up to date for cyclists. To end with, we argue that, although there is some room for improvement in finetuning the technology, the counting sensors allow to objectively map bicycle flows. Notwithstanding, this type of data collection did not show to be the best way to study the impact of the Wayfinding pilot. The scale of the pilot was too small for the counting sensors to detect changing bicycle flows following the information on the digital signs. A survey showed to be a better instrument in this case. The pilot still shows the potential of using counting sensors to understand bicycle traffic behavior also for other objectives than a more efficient use of parking facilities.