Appendices

Exploring the integration of shared e-mopeds at mobility hubs

A case study on shared e-mopeds and public transport in Rotterdam, the Netherlands

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Table of Content

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Appendix A. Extended spatial analysis

The complete spatial analysis of the shared e-moped trip data included some extended analyses that are discussed below.

A.1. OD matrix

The origins and destinations of the shared e-moped trips have been linked to areas – at district level in Rotterdam and city level outside Rotterdam – to be able to see use patterns on a larger scale. Figure A 1 shows the user flows between the top 5 origins and top 5 destinations. From this, it can be concluded that the largest share of trips ends within the origin district, hence causing the top 5 origins and destinations to be the same. The number/percentage of trips starting and ending in the districts in more or less the same which indicates that the system of shared e-mopeds is self-balancing. The districts with the highest frequency of start- and endpoints of the trips, are all located in the centre of Rotterdam. They have a high population density and host important points of interest (e.g., central station, night-life area, shopping district and higher education). Except from a few locations that are excluded due to e-moped nuisance, these districts have complete service area coverage from the shared e-moped providers, something which is not the case in many of the other (less used) districts.

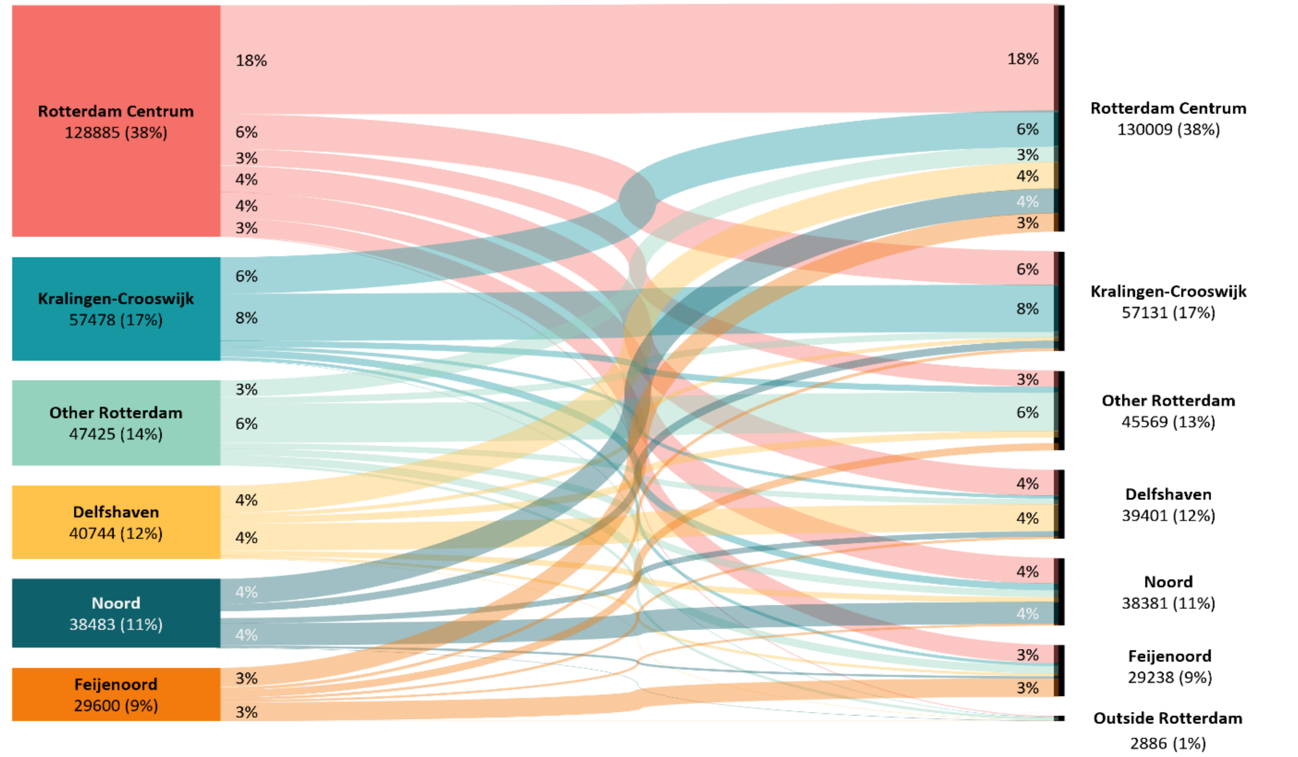
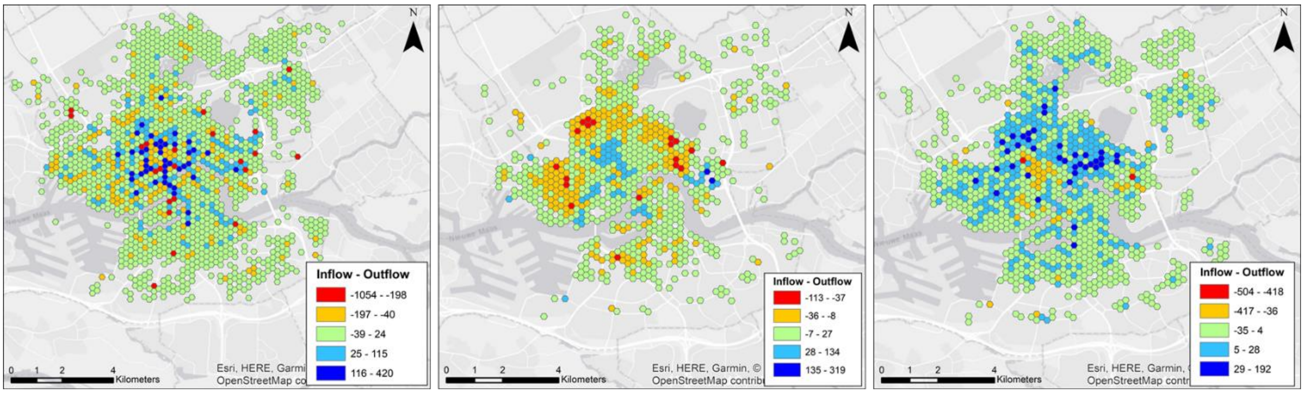


Figure A 1. Sankey diagram of shared e-moped trips. Origins (left) and Destinations (right). [Percentages based on 342262 trips].

A.2. Rush hours

Aggregating trips at neighbourhood levels (i.e., even smaller TAZs) and at specific timeframes (e.g., Morning 6:00-10:00, Afternoon 15:00-19:00 and Evening 19:00-24:00) gives more insight in travel patterns during rush hours. For instance, 10,9% of all morning trips ends in the *CS Kwartier* which houses the Rotterdam central station. Other morning rush destinations are locations that house educational facilities, with *Kralingen Oost* – which houses the *Erasmus University* – and *Kop van Zuid* – housing the *Hogeschool Inholland* – being the largest hotspots with 6.6% and 3.3% of all morning trips ending here, respectively. Larger residential areas, such as *Nieuwe Westen*, *Blijdorp* and *Oude Noorden* are more afternoon/evening destinations, with commuters using their shared e-moped to travel back home from work or school. Overall, destinations in the afternoon or evening are more spatially dispersed.

This phenomenon can also be seen when analysing the difference between inflow and outflow per hexagon of 200m, which provides an exploratory visualisation of travel patterns. From Figure A.2.a, no clear distinct pattern becomes clear, other than some hotspots (e.g., city centre has higher inflow) or coldspots (e.g., locations near metro stations show higher outflow, probably caused by high number of available vehicles at these locations due to geofencing). However, when considering the morning (see Figure A.2.b) and afternoon rush (see Figure A.2.c) separately, a general travel pattern becomes clear, which is in line with earlier findings: shared e-mopeds are used in the morning to commute towards educational locations and the central station, with 41% of all trips going to *Rotterdam Centrum*. In the afternoon, the colour scale of the figures switches, meaning that the shared e-mopeds are now used to commute back to the residential areas of the cities. So, the e-mopeds are used to commute, however, it is difficult to say if this is in addition to PT or as complete substitution of PT.



(a) All trips starting in Rotterdam [347k trips] (b) Morning Rush (8:00 – 9:00) [15k trips] (c) Afternoon Rush (16:00 – 18:00) [49k trips]

Figure A.2. Difference between inflow and outflow for (a) all trips in Rotterdam, (b) morning rush trips and (c) afternoon rush trips.

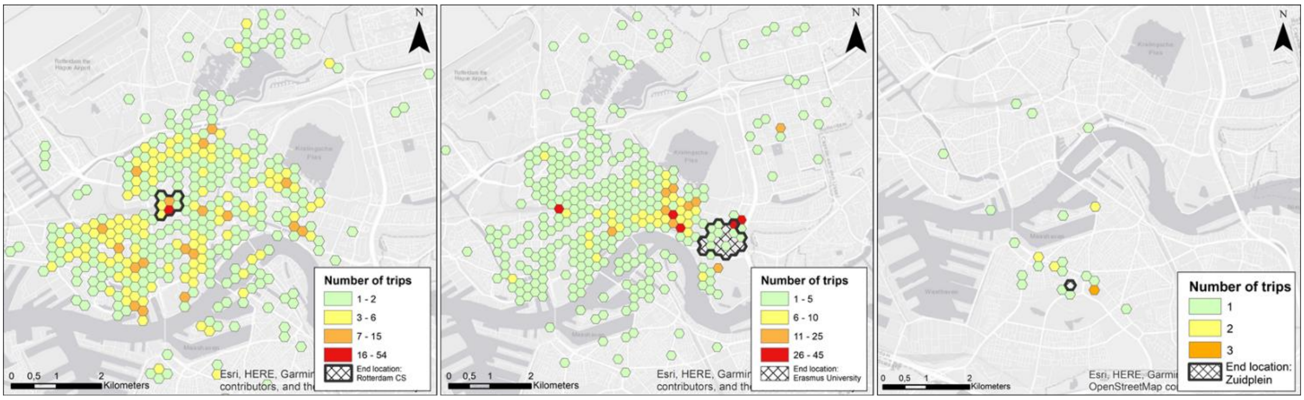
A.3. Specific locations

Three locations, classified as potential mobility hubs, following from the spatial analysis have been selected for the distribution of the survey. **Rotterdam Central Station** is the first location and is a hotspot both for origins and destinations of trips. 4.6% of all trips end near the station, and 5% of all trips starts within the vicinity of the station. Figure A.3.a shows origins of trips travelling towards Rotterdam CS in the morning rush, showing that people come from all over Rotterdam towards the station, potentially to use it as a hub and transfer to the metro or train network. The **Erasmus University** and station *Kralingse Zoom* are the second location. 2.5% and 2.4% of all trips start and end at the university campus, respectively. The location shows a clear commuting pattern between residential areas and the station and campus themselves (see Figure A.3.b), making it an interesting potential hub on a local scale. Lastly, the **Zuidplein** station is considered due to (i) not offering free-floating shared e-mopeds in the neighbourhood but only at geofenced locations, (ii) offering frequent PT and (iii) being included in the *SmartHubs* project. Figure A.3.c shows that not a lot of trips are made via Zuidplein (only 0.2% of all trips) but that most trips are local.

A.4. Travel patterns overview

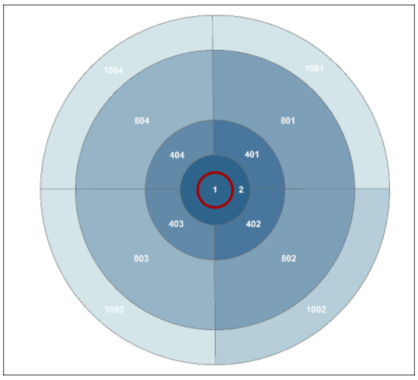
To analyse travel patterns on a larger scale, the city of Rotterdam has been divided into multiple zones, as shown in Figure A.4.k. Zones 1 and 2 form the city centre area, hosting the highly used stations *Rotterdam CS*, *Blaak* and metro station *Beurs*. 60% of all trips starts and/or ends in this zone, with 43% of trips staying within this area. Zones 401- 404 form the city neighbourhoods, and trips starting here are highly attracted by the city centre; 50% of all trips from these zones goes to the central area. Lastly, zones 801-1004 form the suburbs of Rotterdam, ranging up until 10km from the city centre. Only 8% of trips ends here and, again, 50% of all trips starting here go towards the city centre. The analysis of these travel patterns shows that most trips are attracted by the centre area of Rotterdam instead of neighbouring zones, showing the competitiveness of shared e-mopeds with public transportation on longer trips towards the city centre of Rotterdam (both the city centre itself as well as towards the city neighbourhoods for trips starting in the suburbs).

Figure A.4.a-j show where trips from a particular zone go to and Figure A.5.a-j depict where trips towards the zone originate. From these figures the same general conclusions can be made; the shared e-mopeds are primarily used to travel towards the city centre or within the zone itself, showing a combination of possible PT substitution on longer distances and PT complementation in the zones as first or last mile option.

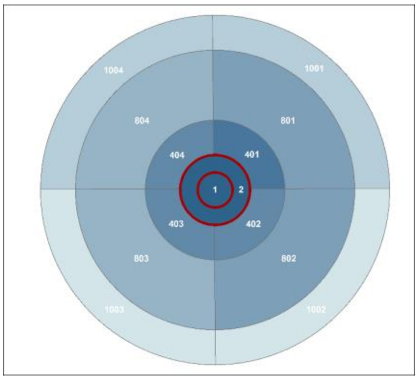


(a) Morning rush origins of trips to Rotterdam CS [1k trips] (b) Morning rush origins of trips to Erasmus University [1.1k trips] (c) Morning rush origins of trips to Zuidplein [26 trips]

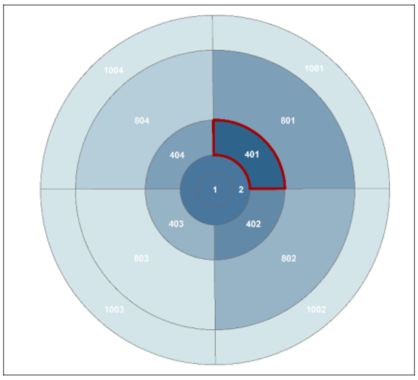
Figure A.3. Location of trip origins to the selected end locations during the morning rush [8:00 – 9:00]. Based on a different number of trips per sub-figure. Note that the used colour scale is different per sub-figure.



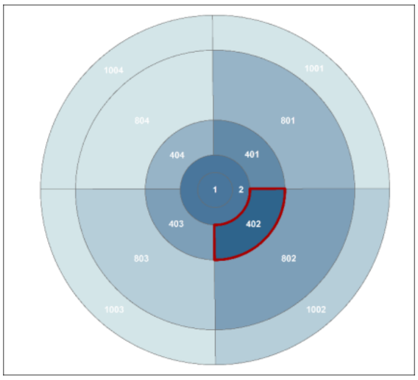
(a) Destinations from zone 1 [103k trips]
73% of trips go to city centre, 24% to city neighbourhoods and 4% to suburbs.



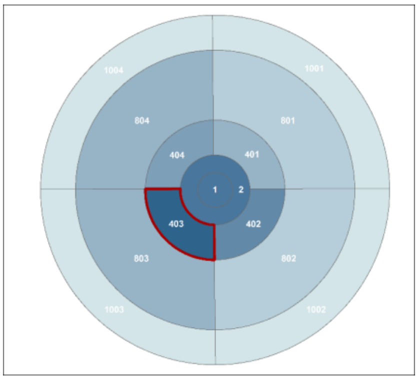
(b) Destinations from zone 2 [101k trips]
71% of trips go to city centre, 25% to city neighbourhoods and 4% to suburbs.



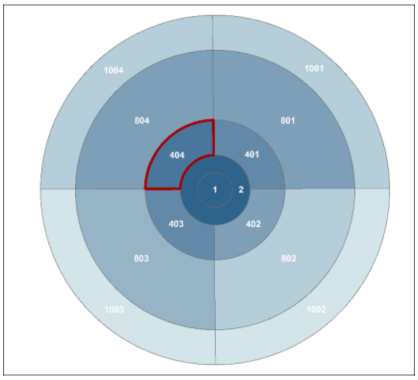
(c) Destinations from zone 401 [41k trips]
49% of trips go to city centre, 45% to city neighbourhoods and 6% to suburbs.



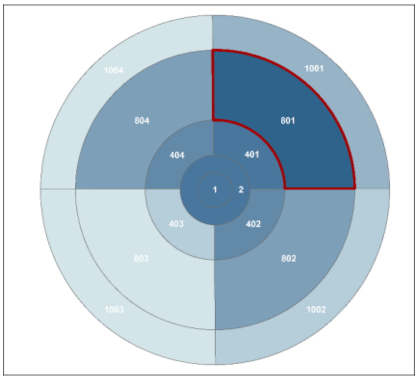
(d) Destinations from zone 402 [34k trips]
42% of trips go to city centre, 50% to city neighbourhoods and 8% to suburbs.



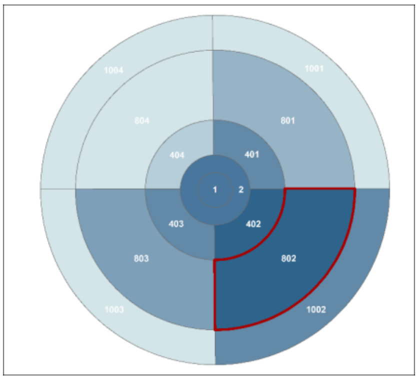
(e) Destinations from zone 403 [21k trips]
51% of trips go to city centre, 43% to city neighbourhoods and 6% to suburbs.



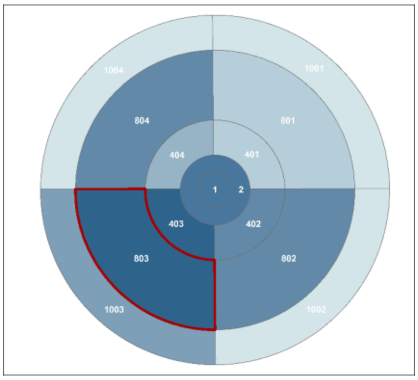
(f) Destinations from zone 404 [14k trips]
55% of trips go to city centre, 37% to city neighbourhoods and 8% to suburbs.



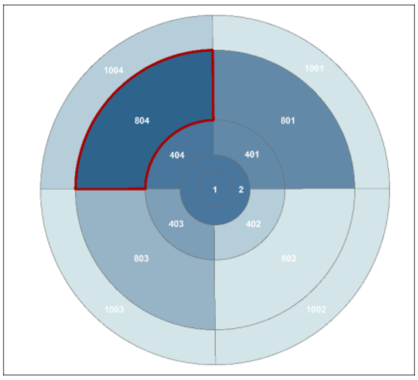
(g) Destinations from zone 801 [15k trips]
26% of trips go to city centre, 23% to city neighbourhoods and 51% to suburbs.



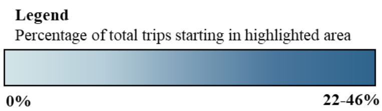
(h) Destinations from zone 802 [8.4k trips]
30% of trips go to city centre, 30% to city neighbourhoods and 40% to suburbs.

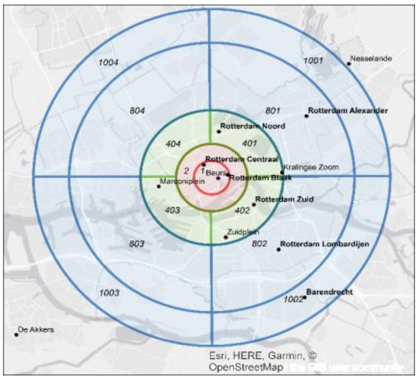


(i) Destinations from zone 803 [700 trips]
22% of trips go to city centre, 33% to city neighbourhoods and 45% to suburbs.



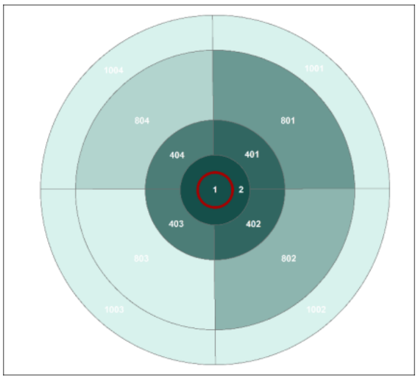
(j) Destinations from zone 804 [2.1k trips]
33% of trips go to city centre, 28% to city neighbourhoods and 39% to suburbs.



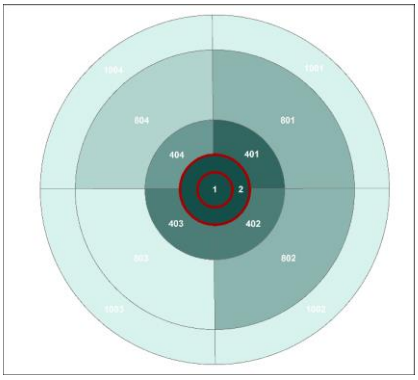


(k) Overview of area classification, incl. locations of train or metro stations

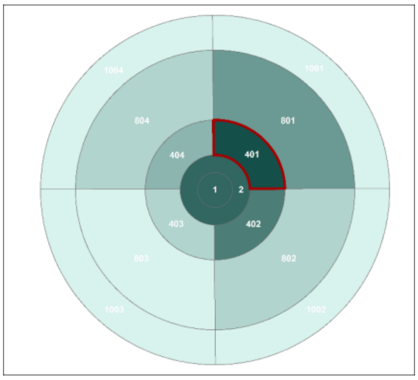
Figure A.4. **Percentage of trip destinations per classified area originating in the specified area.** [Colour scale is based on total number of trips from the highlighted area and is therefore differently scaled per sub-figure].



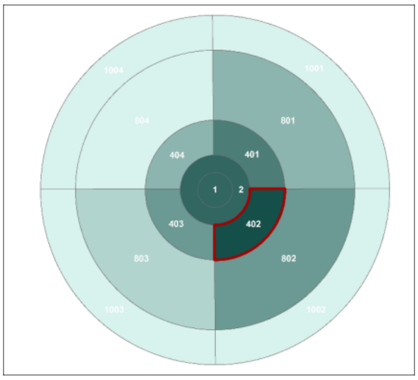
(a) Origins to zone 1 [104k trips]
71% of trips come from city centre, 25% from city neighbourhoods and 4% from suburbs.



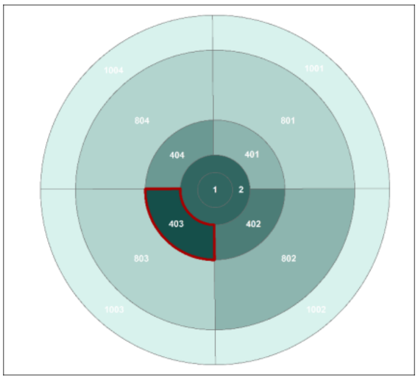
(b) Origins to zone 2 [102k trips]
71% of trips come from city centre, 26% from city neighbourhoods and 3% from suburbs.



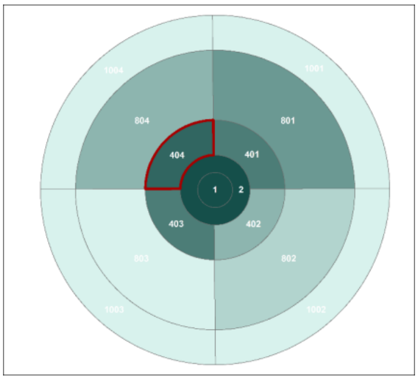
(c) Origins to zone 401 [40k trips]
47% of trips come from city centre, 46% from city neighbourhoods and 7% from suburbs.



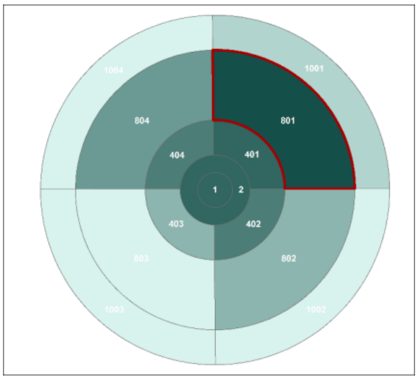
(d) Origins to zone 402 [34k trips]
41% of trips come from city centre, 51% from city neighbourhoods and 8% from suburbs.



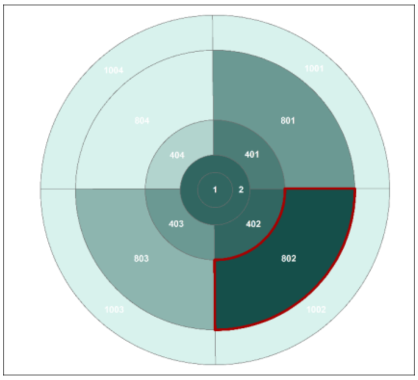
(e) Origins to zone 403 [20k trips]
50% of trips come from city centre, 47% from city neighbourhoods and 3% from suburbs.



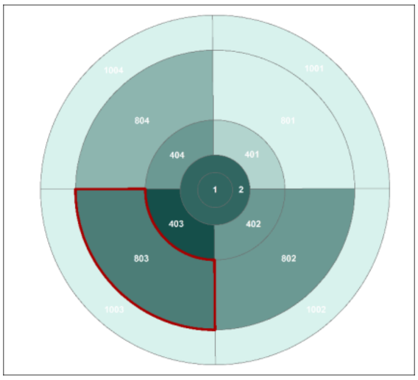
(f) Origins to zone 404 [13k trips]
55% of trips come from city centre, 38% from city neighbourhoods and 6% from suburbs.



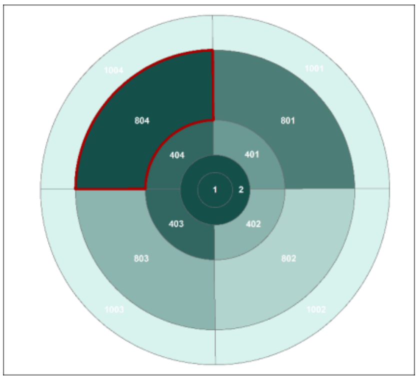
(g) Origins to zone 801 [13k trips]
26% of trips come from city centre, 22% from city neighbourhoods and 52% from suburbs.



(h) Origins to zone 802 [8.4k trips]
30% of trips come from city centre, 31% from city neighbourhoods and 39% from suburbs.



(i) Origins to zone 803 [1.8k trips]
39% of trips come from city centre, 43% from city neighbourhoods and 18% from suburbs.



(j) Origins to zone 804 [2.9k trips]
38% of trips come from city centre, 34% from city neighbourhoods and 29% from suburbs.

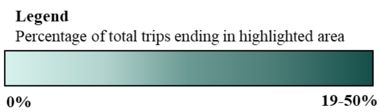


Figure A.5. **Percentage of trip origins per classified area with their destination in the specified area.** [Colour scale is based on total number of trips from the highlighted area and is therefore differently scaled per sub-figure].

Appendix B. Results of OLS and GWR analysis

Full results of the OLS and GWR models used to find a relation between shared e-moped trips and spatial/social factors are shown here.

B.1. Ordinary Least Squares

A global unweighted OLS model was used to find explanatory variables for the dependent variable (DV), the number of shared e-moped starts per neighbourhood. The logarithm of the DV is used to make the variable normally distributed. Full results of the model are shown in Table B.1. From the results, it is learnt that no variables are omitted because of the VIF score, meaning there is no multicollinearity. Population density, percentage of 15-24 years old, 25-44 years old and the PT density significantly associate with the number of trips starts ($p < 0.05$).

Table B.1. Variable coefficients output of OLS model. Dependent variable: *log*(number of trip starts)

Variable	Coefficient	Std. Error	Probability	VIF
Intercept	1.459	3.732	0.697	-
Population density	0.0002	<0.001	0.002*	2.278
Perc. Non-western background	-0.009	0.015	0.565	2.140
Perc. 15-24 years old	0.127	0.050	0.013*	1.650
Perc. 25-44 years old	0.101	0.050	0.048*	6.163
Perc. 45-64 years old	0.003	0.073	0.969	4.160
Perc. 65 years and older	0.044	0.048	0.367	2.780
Perc. male	-0.023	0.058	0.609	2.108
Public transit density	0.066	0.022	0.005*	1.167

The model diagnostics in Table B.2 show that the model predicts 52.4% of the variation in the dependent variable. The *Koenker Statistic* is non-significant, meaning there is no heteroskedasticity among the variables of the model. However, the *Jarque-Bera Statistic* is significant, meaning that the model predictions are biased and not normally distributed. This also comes to light when the model residuals are checked on spatial autocorrelation. The Global Moran's I index of 0.026 ($p < 0.05$) states there is less than 5% likelihood that the clustering of residuals is the result of randomness, which indicates that there are probably variables explaining the DV that are not taken into account in the model.

Table B.2. OLS model diagnostics

Diagnostic	Value OLS	Value GWR
Number of observations	73	73
Multiple R-squared	0.577	0.560
Adjusted R-squared	0.524	0.523
AICc	293.59	286.16
Koenker Statistic	7.837 (p = 0.449)	-
Jarque-Bera Statistic	180.28 (p < 0.001)	-

B.2. Geographically Weighted Regression

Still, a GWR model was fitted with the significant variables of the OLS model. The model diagnostics can be seen in Table B.2, were the GWR model shows a better fit than the OLS model. Table B.3 shows the variable statistics of the GWR model. All variables have a positive relation with the dependent variable: the higher the variable per neighbourhood, the higher the number of shared e-moped trip starts.

Table B.3. Variable coefficients output of GWR model. Dependent variable: *log*(number of trip starts)

Variable	Mean	Std. Dev.	Min	Max
Intercept	1.542	0.77	1.541	1.542
Population density	0.00014	<0.001	0.00014	0.00014
Perc. 15-24 years old	0.1179	<0.001	0.1179	0.1179
Perc. 25-44 years old	0.0738	<0.001	0.0737	0.0738
Public transit density	0.0631	<0.001	0.0630	0.0631

Appendix C. Survey Setup

The purpose of the survey questions is discussed in the sections below.

C.1. Questions of Part A

Part A of the survey focuses on travel behaviour and mode substitution of shared e-moped trips and shared bike trips. The questions related to shared e-moped use are shown in Table C.4. The same questions are also asked to shared bike users, with the same goal, but only when they did not have to answer the shared e-moped questions, for sake of time.

Table C.4. Questions in Part A of the survey related to shared e-moped use

Id.	Questions	Purpose of question
2	How often did you use a shared e-moped in the last year?	Frequency of use
3	What is the main reason not to use a shared e-moped? [1]	Non-user reasoning
4	What is the main reason to travel by shared e-moped? [2]	Trip motivation
5	How often do you use a shared e-moped and PT during the same trip?	Mode complementation to PT
7	*Last trip*: What was the trip's purpose?	Specific trip purpose
8	*Last trip*: How would you have made the trip if the shared e-moped had not been available?	Specific mode substitution
9	*Last trip:* Did you use other modes of transport during the trip?	Specific mode complementation
10	*Last trip:* Did you use a different mode of transport for the other leg of the trip?	Round trip mode substitution

Notes: [1] Only included when respondents answered that they never use a shared e-moped; [2] Only included for users.

C.2. Questions of Part B

Figure C.6 shows the scenario used in Part B of the survey for mobility hubs. After the explanation, the behavioural intention of the respondents is asked: *'I expect to use a shared e-moped at a mobility hub in the future'*, with the answer options on a 5-point Likert-scale (strongly disagree – strongly agree). After that, the statements in Table C.5 must be answered, which relate to the conceptual model.

Explanation of mobility hub in the survey

'A mobility hub (see picture) is a place where shared vehicles and public transport are offered in one place. Suppose that this hub is located at a large public transport stop, such as a metro station, near your home address.

Before you start your trip, you can use an easy to learn application on your phone to schedule, reserve and pay for your complete journey at once, including the shared e-mopeds and public transport.

At the mobility hub, you can start or end the shared e-moped trip within walking distance of public transport like the bus, tram, metro or train. The shared vehicles are located at easily accessible centralized parking locations. The mobility hub also offers a service point with information and ticket sales.'

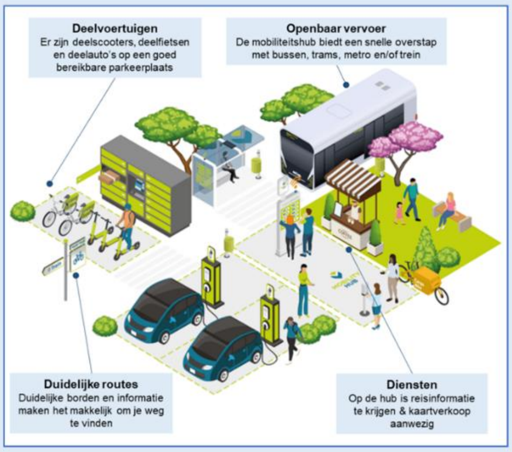


Figure C.6. Explanation of the mobility hub scenario as described in the survey.

Table C.5. Statements related to factors influencing the behavioural intention.

Statement: ***It is important to me that…***	**Related variable [1]**	**PE [2]**	**EE [3]**
… I reach my destination as quickly as possible.	Travel time	-	-
… I take travel costs into account.	Travel costs	-	-
… a shared e-moped is available close to my home address.	PI – distance to moped	x	
… a shared e-moped is always available.	PI – availability	x	
… a shared e-moped is available on a central location close to PT.	PI – integration PT	x	
… the shared e-moped is easy to use.	PI – ease of use		x
… I can find my way around easily at the hub.	PI – wayfinding		x
… there is live travel information available at the hub.	DI – travel information		x
… I can easily transfer between shared e-moped and PT.	PI – ease of transfer	x	
… I can easily transfer between shared e-moped and a shared e-bike or shared car.	PI – ease of transfer	x	
… there are proper parking facilities on the hub.	PI – parking facilities	x	
… I can buy a travel ticket at a service point at the hub.	DI – payment methods	x	
… I can plan and pay by shared e-moped and PT trip in one mobile application.	DI – multimodal planner		x
… this application is easy to learn.	DI – easy to learn		x

Notes: [1] Variables are related to: PI = Physical Integration or DI = Digital Integration; [2] PE = Performance Expectancy. [3] EE = Effort Expectancy.

Appendix D. Chi-square test of independence for demographics between users and non-users

The socio-demographic variables are compared to see if there is a significant difference between the users and non-users of shared e-mopeds in the sample. Users are defined as people who use a shared e-moped more than 5 times per year at least, which is redefined as ‘sometimes’ or ‘often’. Migration is not taken into account since the expected count per category was too low (25% of cells with expected count below 5, even when ‘western’ and ‘non-western’ were taken together). For digital skills, ‘level 0’ and ‘level 1’ are combined, as well as ’65-74 years old’ and ’75 and older’ for age to make sure the expected counts were high enough. The results of these chi-square tests are depicted in Table D.6.

Table D.6. Results of Pearson’s Chi-square test of independence for users and non-users

Factors	N	Chi-square value	Df.	Asymptotic Sig.
Gender	342	5.298	1	0.021 *
Educational level	339	3.684	2	0.159
Income level	250	1.658	2	0.437
Age category	351	40.718	5	<0.001 *
Driver’s license	341	11.752	2	0.003 *
Digital skill level	347	90.835	2	<0.001 *

Note: * significant relation, $p < 0.05$

Appendix E. Kendall's thau correlations between independent variables

Table E.7 and Table E.8 provide the Kendall's thau correlation coefficients between the ordinal independent variables that are used in the logistic regression models. Some abbreviations that are used in the tables: public transport (PT), shared e-moped (SM), shared bike (SB) and mobility hub (Hub).

Table E.7. Kendall's thau correlation coefficients for the ordinal independent variables. Part 1.A.

		Travel time	Travel costs	Dis-tance to SM	Availa-bility SM	Inte-gration SM & PT	Ease of use SM	Way-finding Hub	Travel info Hub	Trans-fer PT	Trans-fer shared veh.	Park Hub	Ticket Hub
Travel time	*Coeff.*	1.000	,190**	,166**	,218**	,212**	,205**	,197**	,186**	,226**	,101*	,180**	0.084
	Sig.		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.000	0.083
	N	393	393	385	385	385	385	362	362	362	362	362	362
Travel costs	*Coeff.*	,190**	1.000	,098*	,133**	,177**	,185**	,242**	,232**	,207**	,156**	,194**	,187**
	Sig.	0.000		0.036	0.005	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
	N	393	393	385	385	385	385	362	362	362	362	362	362
Distance to SM	*Coeff.*	,166**	,098*	1.000	,676**	,580**	,587**	,325**	,217**	,528**	,293**	,336**	,114*
	Sig.	0.000	0.036		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015
	N	385	385	385	385	385	385	362	362	362	362	362	362
Availability SM	*Coeff.*	,218**	,133**	,676**	1.000	,697**	,657**	,373**	,306**	,594**	,333**	,387**	,129**
	Sig.	0.000	0.005	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006
	N	385	385	385	385	385	385	362	362	362	362	362	362
Integration PT	*Coeff.*	,212**	,177**	,580**	,697**	1.000	,721**	,433**	,391**	,657**	,424**	,447**	,146**
	Sig.	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.002
	N	385	385	385	385	385	385	362	362	362	362	362	362
Ease of use SM	*Coeff.*	,205**	,185**	,587**	,657**	,721**	1.000	,521**	,428**	,624**	,315**	,437**	0.073
	Sig.	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.122
	N	385	385	385	385	385	385	362	362	362	362	362	362
Way finding Hub	*Coeff.*	,197**	,242**	,325**	,373**	,433**	,521**	1.000	,692**	,522**	,287**	,452**	,203**
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000
	N	362	362	362	362	362	362	362	362	362	362	362	362
Travel info Hub	*Coeff.*	,186**	,232**	,217**	,306**	,391**	,428**	,692**	1.000	,402**	,257**	,397**	,283**
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
	N	362	362	362	362	362	362	362	362	362	362	362	362
Transfer PT	*Coeff.*	,226**	,207**	,528**	,594**	,657**	,624**	,522**	,402**	1.000	,513**	,465**	,124**
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.008
	N	362	362	362	362	362	362	362	362	362	362	362	362
Transfer shared	*Coeff.*	,101*	,156**	,293**	,333**	,424**	,315**	,287**	,257**	,513**	1.000	,379**	,290**
	Sig.	0.037	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
	N	362	362	362	362	362	362	362	362	362	362	362	362
Park Hub	*Coeff.*	,180**	,194**	,336**	,387**	,447**	,437**	,452**	,397**	,465**	,379**	1.000	,299**
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
	N	362	362	362	362	362	362	362	362	362	362	362	362
Ticket Hub	*Coeff.*	0.084	,187**	,114*	,129**	,146**	0.073	,203**	,283**	,124**	,290**	,299**	1.000
	Sig.	0.083	0.000	0.015	0.006	0.002	0.122	0.000	0.000	0.008	0.000	0.000	
	N	362	362	362	362	362	362	362	362	362	362	362	362
Plan via App	*Coeff.*	,217**	,136**	,429**	,517**	,561**	,606**	,434**	,408**	,582**	,354**	,417**	,175**
	Sig.	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	362	362	362	362	362	362	362	362	362	362	362	362
Ease learn App	*Coeff.*	,219**	,191**	,335**	,426**	,513**	,532**	,568**	,440**	,504**	,310**	,486**	,224**
	Sig.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	362	362	362	362	362	362	362	362	362	362	362	362
Social influence	*Coeff.*	0.092	-0.032	,237**	,211**	,188**	,164**	0.068	0.022	,199**	,112*	-0.004	-0.007
	Sig.	0.074	0.539	0.000	0.000	0.000	0.001	0.182	0.662	0.000	0.025	0.940	0.886
	N	342	342	342	342	342	342	342	342	342	342	342	342
Age	*Coeff.*	-,202**	-,117*	-,205**	-,187**	-,195**	-,271**	-,226**	-,169**	-,234**	-0.011	-,090*	0.030
	Sig.	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.799	0.046	0.498
	N	351	351	351	351	351	351	351	351	351	351	351	351
Income	*Coeff.*	0.088	-0.098	0.048	0.093	0.033	0.086	0.104	0.090	0.044	-0.012	0.045	-,114*
	Sig.	0.127	0.090	0.389	0.098	0.560	0.129	0.069	0.117	0.438	0.834	0.431	0.042
	N	254	254	254	254	254	254	254	254	254	254	254	254

Note: ** correlation is significant at the 0.01 level (2-tailed), * correlation is significant at the 0.05 level (2-tailed).

Table E.7. (continued). Kendall's thau correlation coefficients for the ordinal independent variables. Part 1.B.

		Travel time	Travel costs	Dis-tance to SM	Availa-bility SM	Inte-gration SM & PT	Ease of use SM	Way-finding Hub	Travel info Hub	Trans-fer PT	Trans-fer shared veh.	Park Hub	Ticket Hub
Education	*Coeff.*	0.018	-0.056	-0.036	0.007	-0.067	0.003	,128*	0.094	0.068	-0.074	0.025	-,117*
	Sig.	0.719	0.268	0.456	0.882	0.176	0.957	0.010	0.060	0.166	0.131	0.608	0.017
	N	347	347	347	347	347	347	347	347	347	347	347	347
Share mobility use	*Coeff.*	,159**	-0.047	,217**	,227**	,153**	,182**	0.080	0.031	,216**	0.070	0.013	-,137**
	Sig.	0.001	0.339	0.000	0.000	0.002	0.000	0.117	0.544	0.000	0.160	0.790	0.006
	N	393	393	385	385	385	385	362	362	362	362	362	362
Car use	*Coeff.*	,157**	-0.033	,100*	,136**	,145**	,142**	0.031	0.014	,122*	,142**	,258**	-0.032
	Sig.	0.002	0.520	0.045	0.006	0.004	0.005	0.548	0.776	0.015	0.004	0.000	0.524
	N	361	361	361	361	361	361	361	361	361	361	361	361
Digi skills	*Coeff.*	,164**	0.063	,204**	,252**	,155**	,202**	,149**	,125*	,214**	,117*	,101*	-,101*
	Sig.	0.001	0.206	0.000	0.000	0.001	0.000	0.002	0.010	0.000	0.014	0.036	0.035
	N	357	357	357	357	357	357	357	357	357	357	357	357
Driver license	*Coeff.*	0.102	0.044	0.038	0.073	0.092	,108*	0.074	0.098	,155**	0.033	,196**	-0.081
	Sig.	0.051	0.403	0.449	0.149	0.071	0.036	0.152	0.057	0.002	0.516	0.000	0.109
	N	348	348	348	348	348	348	348	348	348	348	348	348
Migration	*Coeff.*	0.045	0.054	-0.020	-0.004	-0.045	-0.071	-0.060	-0.010	-0.026	0.019	-0.046	0.007
	Sig.	0.399	0.314	0.709	0.932	0.391	0.181	0.260	0.847	0.615	0.711	0.381	0.898
	N	327	327	327	327	327	327	327	327	327	327	327	327

Note: ** correlation is significant at the 0.01 level (2-tailed), * correlation is significant at the 0.05 level (2-tailed).

Table E.8. Kendall's thau correlation coefficients for the ordinal independent variables. Part 2.A.

		Plan via App	Ease learn App	Social influence	Age	Income level	Education level	Shared mob. use	Car use	Digital skills	Driver 's license	Migration backg.
Travel time	*Coeff.*	,217**	,219**	0.092	-,202**	0.088	0.018	,159**	,157**	,164**	0.102	0.045
	Sig.	0.000	0.000	0.074	0.000	0.127	0.719	0.001	0.002	0.001	0.051	0.399
	N	362	362	342	351	254	347	393	361	357	348	327
Travel costs	*Coeff.*	,136**	,191**	-0.032	-,117*	-0.098	-0.056	-0.047	-0.033	0.063	0.044	0.054
	Sig.	0.005	0.000	0.539	0.012	0.090	0.268	0.339	0.520	0.206	0.403	0.314
	N	362	362	342	351	254	347	393	361	357	348	327
Distance to SM	*Coeff.*	,429**	,335**	,237**	-,205**	0.048	-0.036	,217**	,100*	,204**	0.038	-0.020
	Sig.	0.000	0.000	0.000	0.000	0.389	0.456	0.000	0.045	0.000	0.449	0.709
	N	362	362	342	351	254	347	385	361	357	348	327
Availability SM	*Coeff.*	,517**	,426**	,211**	-,187**	0.093	0.007	,227**	,136**	,252**	0.073	-0.004
	Sig.	0.000	0.000	0.000	0.000	0.098	0.882	0.000	0.006	0.000	0.149	0.932
	N	362	362	342	351	254	347	385	361	357	348	327
Integration PT	*Coeff.*	,561**	,513**	,188**	-,195**	0.033	-0.067	,153**	,145**	,155**	0.092	-0.045
	Sig.	0.000	0.000	0.000	0.000	0.560	0.176	0.002	0.004	0.001	0.071	0.391
	N	362	362	342	351	254	347	385	361	357	348	327
Ease of use SM	*Coeff.*	,606**	,532**	,164**	-,271**	0.086	0.003	,182**	,142**	,202**	,108*	-0.071
	Sig.	0.000	0.000	0.001	0.000	0.129	0.957	0.000	0.005	0.000	0.036	0.181
	N	362	362	342	351	254	347	385	361	357	348	327
Wayfinding Hub	*Coeff.*	,434**	,568**	0.068	-,226**	0.104	,128*	0.080	0.031	,149**	0.074	-0.060
	Sig.	0.000	0.000	0.182	0.000	0.069	0.010	0.117	0.548	0.002	0.152	0.260
	N	362	362	342	351	254	347	362	361	357	348	327
Travel info Hub	*Coeff.*	,408**	,440**	0.022	-,169**	0.090	0.094	0.031	0.014	,125*	0.098	-0.010
	Sig.	0.000	0.000	0.662	0.000	0.117	0.060	0.544	0.776	0.010	0.057	0.847
	N	362	362	342	351	254	347	362	361	357	348	327
Transfer PT	*Coeff.*	,582**	,504**	,199**	-,234**	0.044	0.068	,216**	,122*	,214**	,155**	-0.026
	Sig.	0.000	0.000	0.000	0.000	0.438	0.166	0.000	0.015	0.000	0.002	0.615
	N	362	362	342	351	254	347	362	361	357	348	327
Transfer shared	*Coeff.*	,354**	,310**	,112*	-0.011	-0.012	-0.074	0.070	,142**	,117*	0.033	0.019
	Sig.	0.000	0.000	0.025	0.799	0.834	0.131	0.160	0.004	0.014	0.516	0.711
	N	362	362	342	351	254	347	362	361	357	348	327
Park Hub	*Coeff.*	,417**	,486**	-0.004	-,090*	0.045	0.025	0.013	,258**	,101*	,196**	-0.046
	Sig.	0.000	0.000	0.940	0.046	0.431	0.608	0.790	0.000	0.036	0.000	0.381
	N	362	362	342	351	254	347	362	361	357	348	327
Ticket Hub	*Coeff.*	,175**	,224**	-0.007	0.030	-,114*	-,117*	-,137**	-0.032	-,101*	-0.081	0.007
	Sig.	0.000	0.000	0.886	0.498	0.042	0.017	0.006	0.524	0.035	0.109	0.898
	N	362	362	342	351	254	347	362	361	357	348	327
Plan via App	*Coeff.*	1.000	,617**	,165**	-,203**	0.063	0.015	,167**	,157**	,200**	,132**	-0.050
	Sig.		0.000	0.001	0.000	0.264	0.763	0.001	0.002	0.000	0.009	0.340
	N	362	362	342	351	254	347	362	361	357	348	327
Ease learn App	*Coeff.*	,617**	1.000	,104*	-,216**	0.054	0.022	0.058	,111*	,150**	,151**	-0.038
	Sig.	0.000		0.041	0.000	0.346	0.653	0.249	0.028	0.002	0.003	0.476
	N	362	362	342	351	254	347	362	361	357	348	327
Social influence	*Coeff.*	,165**	,104*	1.000	-,120*	0.015	-0.020	,339**	0.048	,272**	-0.022	0.029
	Sig.	0.001	0.041		0.011	0.795	0.703	0.000	0.370	0.000	0.683	0.603
	N	342	342	342	334	245	332	342	342	340	331	314
Age	*Coeff.*	-,203**	-,216**	-,120*	1.000	0.072	-0.084	-,279**	0.022	-,222**	-0.005	0.000
	Sig.	0.000	0.000	0.011		0.175	0.069	0.000	0.645	0.000	0.922	0.996
	N	351	351	334	351	250	341	351	351	347	340	325
Income	*Coeff.*	0.063	0.054	0.015	0.072	1.000	,383**	0.068	,339**	0.104	,299**	0.036
	Sig.	0.264	0.346	0.795	0.175		0.000	0.252	0.000	0.068	0.000	0.556
	N	254	254	245	250	254	253	254	254	251	252	241

Note: ** correlation is significant at the 0.01 level (2-tailed), * correlation is significant at the 0.05 level (2-tailed).

Table E.8. (continued). Kendall's thau correlation coefficients for the ordinal independent variables. Part 2.B.

		Plan via App	Ease learn App	Social influ-ence	Age	In-come level	Edu-cation level	Shared mob. use	Car use	Digi-tal skills	Driver 's li-cense	Migrati on backg.
Educa tion	*Coeff.*	0.015	0.022	-0.020	-0.084	,383**	1.000	,107*	,102*	0.059	,253**	-0.024
	Sig.	0.763	0.653	0.703	0.069	0.000		0.039	0.049	0.233	0.000	0.658
	N	347	347	332	341	253	347	347	347	344	339	320
Share mobili ty use	*Coeff.*	,167**	0.058	,339**	-,279**	0.068	,107*	1.000	0.021	,374**	0.090	0.001
	Sig.	0.001	0.249	0.000	0.000	0.252	0.039		0.694	0.000	0.094	0.989
	N	362	362	342	351	254	347	400	361	357	348	327
Car use	*Coeff.*	,157**	,111*	0.048	0.022	,339**	,102*	0.021	1.000	-0.026	,467**	-,203**
	Sig.	0.002	0.028	0.370	0.645	0.000	0.049	0.694		0.613	0.000	0.000
	N	361	361	342	351	254	347	361	361	357	348	327
Digi skills	*Coeff.*	,200**	,150**	,272**	-,222**	0.104	0.059	,374**	-0.026	1.000	,113*	0.088
	Sig.	0.000	0.002	0.000	0.000	0.068	0.233	0.000	0.613		0.029	0.100
	N	357	357	340	347	251	344	357	357	357	346	323
Driver licens e	*Coeff.*	,132**	,151**	-0.022	-0.005	,299**	,253**	0.090	,467**	,113*	1.000	-0.044
	Sig.	0.009	0.003	0.683	0.922	0.000	0.000	0.094	0.000	0.029		0.428
	N	348	348	331	340	252	339	348	348	346	348	320
Migra tion	*Coeff.*	-0.050	-0.038	0.029	0.000	0.036	-0.024	0.001	-,203**	0.088	-0.044	1.000
	Sig.	0.340	0.476	0.603	0.996	0.556	0.658	0.989	0.000	0.100	0.428	
	N	327	327	314	325	241	320	327	327	323	320	327

Note: ** correlation is significant at the 0.01 level (2-tailed), * correlation is significant at the 0.05 level (2-tailed).

Appendix F. Kendall's thau correlations between socio-demographic variables and behavioural intention

In Table F.9 the correlation coefficients for socio-demographic characteristics with the five intention variables can be seen.

Table F.9. Kendall's thau correlation coefficients between ordinal socio-demographic variables and behavioural intention statements.

		Intention to use shared e-moped at **mobility hub**	Intention to use shared e-moped with **bus**	Intention to use shared e-moped with **tram**	Intention to use shared e-moped with **metro**	Intention to use shared e-moped with **train**
Education level	*Coeff.*	-,112*	-,179**	-,129*	-0.082	-0.022
	Sig.	0.024	0.000	0.010	0.099	0.653
	N	347	347	347	347	347
Income level	*Coeff.*	-0.020	-0.113	-0.094	0.010	0.031
	Sig.	0.717	0.051	0.101	0.866	0.578
	N	254	254	254	254	254
PT use	*Coeff.*	0.077	0.045	0.026	0.062	0.076
	Sig.	0.124	0.388	0.616	0.218	0.129
	N	361	361	361	361	361
Shared e-moped or bike use	*Coeff.*	,232**	0.070	,185**	,249**	,330**
	Sig.	0.000	0.155	0.000	0.000	0.000
	N	400	396	396	396	396
Car use	*Coeff.*	0.074	0.014	0.052	0.075	0.049
	Sig.	0.140	0.792	0.306	0.139	0.326
	N	361	361	361	361	361
Digital skills	*Coeff.*	,264**	,151**	,217**	,257**	,315**
	Sig.	0.000	0.002	0.000	0.000	0.000
	N	357	357	357	357	357
Driver's license	*Coeff.*	0.027	-0.063	0.008	0.045	0.035
	Sig.	0.593	0.232	0.876	0.387	0.492
	N	348	348	348	348	348
Migration background	*Coeff.*	-0.042	-0.037	-0.062	-0.080	-0.082
	Sig.	0.424	0.494	0.247	0.131	0.122
	N	327	327	327	327	327
Age category	*Coeff.*	-,155**	-0.046	-,096*	-,151**	-,178**
	Sig.	0.001	0.314	0.037	0.001	0.000
	N	351	351	351	351	351

Note: ** correlation is significant at the 0.01 level (2-tailed), * correlation is significant at the 0.05 level (2-tailed).

Appendix G. Principal Component Analysis for independent variables

A principal component analysis is conducted for the independent variables that correlated heavily in order to reduce the number of variables.

G.1. Correlated ordinal variables & possible components

From Appendix E, it becomes clear that a number of variables heavily correlates, with a correlation coefficient above 0.35 considered high (SPSS Tutorials, 2022). This is undesirable since the variables might explain the same underlying construct. The Kendall's thau correlation coefficients for the multimodal trip characteristics that are significantly high are shown in Table G.10 below (following from Table E.7 and Table E.8). Possible components, based on theoretical constructs, are also shown in the table. Based on the correlation coefficients, for example, it seems that the moped based statements correlate heavily with each other, showing a possibility to reduce these variables into one component.

Table G.10. Significant variable correlation coefficients for multimodal trip characteristics.
All correlations are significant at the 0.01 level.

	Distance to SM	Availability of SM	Integr. with PT	Ease of use SM	Wayfinding at Hub	Travel info at Hub	Transf to PT at Hub	Transf to SV at Hub	Parking at Hub	Ticket at Hub	Plan App	Ease to learn App
UTAUT construct	*PE*	*PE*	*PE*	*EE*	*EE*	*EE*	*PE*	*PE*	*PE*	*PE*	*EE*	*EE*
Integration cat.	*PI*	*PI*	*PI*	*PI*	*PI*	*DI*	*PI*	*PI*	*PI*	*DI*	*DI*	*DI*
Moped or Hub cat.	*moped*	*moped*	*moped*	*moped*	*hub*	*hub*	*hub*	*hub*	*hub*	*hub*	*hub*	*hub*
Distance to SM	1.000	,676**	,580**	,587**	,325**	,217**	,528**	,293**	,336**	,114*	,429**	,335**
Availability of SM	,676**	1.000	,697**	,657**	,373**	,306**	,594**	,333**	,387**	,129**	,517**	,426**
Integration SM with PT	,580**	,697**	1.000	,721**	,433**	,391**	,657**	,424**	,447**	,146**	,561**	,513**
Ease of use SM	,587**	,657**	,721**	1.000	,521**	,428**	,624**	,315**	,437**	0.073	,606**	,532**
Wayfinding at Hub	,325**	,373**	,433**	,521**	1.000	,692**	,522**	,287**	,452**	,203**	,434**	,568**
Travel info at Hub	,217**	,306**	,391**	,428**	,692**	1.000	,402**	,257**	,397**	,283**	,408**	,440**
Transfer to PT at Hub	,528**	,594**	,657**	,624**	,522**	,402**	1.000	,513**	,465**	,124**	,582**	,504**
Transfer to shared veh. at Hub	,293**	,333**	,424**	,315**	,287**	,257**	,513**	1.000	,379**	,290**	,354**	,310**
Parking at Hub	,336**	,387**	,447**	,437**	,452**	,397**	,465**	,379**	1.000	,299**	,417**	,486**
Ticket at Hub	,114*	,129**	,146**	0.073	,203**	,283**	,124**	,290**	,299**	1.000	,175**	,224**
Planner App	,429**	,517**	,561**	,606**	,434**	,408**	,582**	,354**	,417**	,175**	1.000	,617**
Ease to learn App	,335**	,426**	,513**	,532**	,568**	,440**	,504**	,310**	,486**	,224**	,617**	1.000

G.2. Principal Component Analysis

A principal component analysis (PCA) is conducted on all variables from Table G.10. To meet the assumptions of performing a PCA, the variables should show a high correlation (above 0.35) to indicate factorability and the KMO measure of sampling adequacy provides a value of 0.845 ($p < 0.001$), which is above the threshold of 0.5. Based on Kaiser's criterion of selecting components with an eigenvalue above 1 and showing an elbow in the scree-plot, the number of components to be derived is two. After a first PCA, not all variables clearly match with one of the two components (*multimodal planner app, ease to learn the app, transfer to PT* and *transfer to shared vehicles*), so these variables are omitted in the second PCA. Table G.11 shows the factor loadings of the variables using a PCA with oblique rotation based on the pattern matrix. The four e-moped variables load high on component 1, while the four remaining hub factors load high on component 2. The components share a correlation coefficient of 0.364, meaning the components themselves also strongly correlate. The component scores per respondent are determined within SPSS using the regression method with suppressing small coefficients (< +/- 0.3) to make sure only the four main variables per component are taken into account.

Table G.11. Results of the PCA factor loadings and related diagnostics. N = 362.

	Component 1	**Component 2**
Distance to shared e-moped	0.873	-0.093
Availability of shared e-moped	0.895	-0.018
Integration of shared e-moped to public transportation	0.843	0.103
Ease of using the shared e-moped	0.842	0.106
Wayfinding at the mobility hub	0.296	0.674
Live travel info at mobility hub	0.129	0.782
Parking at the mobility hub	0.313	0.552
Ticket sale at hub	-0.215	0.749
Eigenvalue	4.199	1.279
Percentage of variance explained	52.5 %	15.9 %
Cronbach's alpha	0.943 (df. = 5)	0.858 (df. = 5)

The components can be summarized as follows:

1. *Component 1* – (Importance of) shared e-moped supply factors
2. *Component 2* – (Importance of) mobility hub facilities

G.3. Ordinal logistic regression models for variables of components

To investigate the impact of the different variables within the components on the dependent variable, an ordinal regression model is analysed (DV: Intention to use a shared e-moped at a mobility hub) for the two times four variables that are included in the components. The results of the first analysis (N = 400) are shown in Table G.12. The model was found to be an improvement from the *intercept only* model, with a pseudo R-squared of 0.27 (Cox and Snell). The test of parallel lines was non-significant ($p = 0.13$), which indicates that the proportional odds requirement is met.

Table G.12. Results of ordinal logistic regression model for variables of first component. Dependent variable: intention to use a shared e-moped at a mobility hub.

	b	Std. error	Wald	Sig.	Exp(b)	Lower bound	Upper bound
Intention = disagree	-1.060	.187	32.248	.000	0.346	-1.426	-.694
Intention = neutral	0.579	.179	10.512	.001	1.784	.229	.930
Distance to SM = disagree	-1.774	.403	19.417	.000	0.170	-2.563	-.985
Distance to SM = neutral	-0.561	.305	3.386	.066	0.571	-1.159	.037
Distance to SM = agree	0[a]				1		
Availability of SM = disagree	-0.692	.487	2.018	.155	0.501	-1.646	.263
Availability of SM = neutral	-0.321	.334	.927	.336	0.725	-.976	.333
Availability of SM = agree	0[a]				1		
Integration of SM at PT = disagree	-1.863	.576	10.457	.001	0.155	-2.993	-.734
Integration of SM at PT = neutral	-0.752	.360	4.359	.037	0.471	-1.457	-.046
Integration of SM at PT = agree	0[a]				1		
Ease of using SM = disagree	1.205	.574	4.403	.036	3.337	.079	2.330
Ease of using SM = neutral	-0.176	.397	.198	.656	0.839	-.954	.601
Ease of using SM = agree	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant.

The second model uses the four variables that make up the second component. The results of the analysis (N = 400) are shown in Table G.13. The model was found to be an improvement from the *intercept only* model, with a pseudo R-squared of 0.099 (Cox and Snell). However, the test of parallel lines showed to be significant ($p < 0.05$), which indicates that the proportional odds requirement is not met, and the results cannot be accurately interpreted.

Table G.13. Results of ordinal logistic regression model for variables of second component. Dependent variable: intention to use a shared e-moped at a mobility hub.

	b	Std. error	Wald	Sig.	Exp(b)	Lower bound	Upper bound
Intention = disagree	-0.260	.190	1.875	.171	0.771	-.632	.112
Intention = neutral	1.138	.203	31.538	.000	3.121	.741	1.535
Wayfinding at Hub = disagree	-1.247	.588	4.506	.034	0.288	-2.399	-.096
Wayfinding at Hub = neutral	-0.915	.367	6.224	.013	0.401	-1.634	-.196
Wayfinding at Hub = agree	0[a]				1		
Travel information at Hub = disagree	0.732	.486	2.264	.132	2.079	-.222	1.685
Travel information at Hub = neutral	0.616	.361	2.905	.088	1.852	-.092	1.324
Travel information at Hub = agree	0[a]				1		
Parking at Hub = disagree	-1.193	.366	10.615	.001	0.303	-1.911	-.475
Parking at Hub = neutral	-0.695	.286	5.912	.015	0.499	-1.256	-.135
Parking at Hub = agree	0[a]				1		
Ticket sale at Hub = disagree	-0.161	.288	.314	.575	0.851	-.725	.403
Ticket sale at Hub = neutral	0.043	.282	.023	.879	1.044	-.509	.595
Ticket sale at Hub = agree	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant.

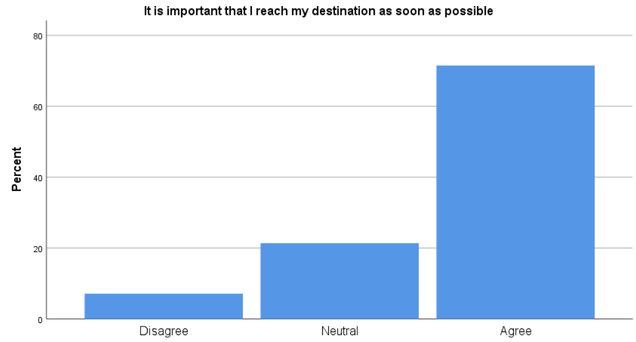
Appendix H. Collinearity statistics for all independent variables and all dependent variables

For all five different dependent variables, the collinearity statistics are shown in Table H.14. Since the VIF values are all below 4.0, multicollinearity does not seem to be an issue for the ordinal logistics regression models.

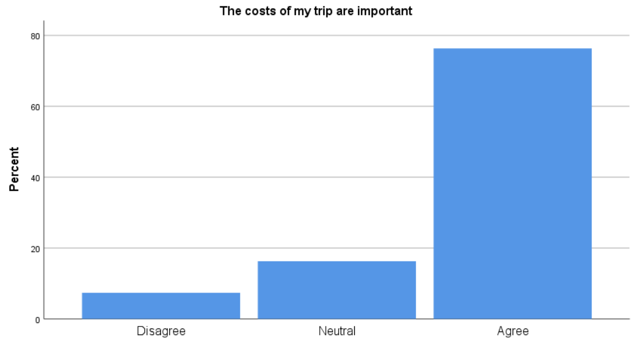
Table H.14. Tolerance and VIF collinearity statistics for all independent variables.

	Intention to use shared e-moped at mobility hub		Intention to use shared e-moped in combination with bus		Intention to use shared e-moped in combination with tram		Intention to use shared e-moped in combination with metro		Intention to use shared e-moped in combination with train	
	Tolerance	*VIF*	*Tolerance*	*VIF*	*Tolerance*	*VIF*	*Tolerance*	*VIF*	*Tolerance*	*VIF*
Travel time	.804	1.244	.804	1.244	.804	1.244	.804	1.244	.804	1.244
Travel costs	.819	1.221	.819	1.221	.819	1.221	.819	1.221	.819	1.221
C1 – Shared e-moped supply factors	.390	2.565	.390	2.565	.390	2.565	.390	2.565	.390	2.565
C2 – Mobility hub facilities	.674	1.485	.674	1.485	.674	1.485	.674	1.485	.674	1.485
Transfer to PT	.390	2.562	.390	2.562	.390	2.562	.390	2.562	.390	2.562
Multimodal application	.510	1.960	.510	1.960	.510	1.960	.510	1.960	.510	1.960
Social influence	.820	1.220	.820	1.220	.820	1.220	.820	1.220	.820	1.220
Education level	.922	1.085	.922	1.085	.922	1.085	.922	1.085	.922	1.085
Shared mobility use	.668	1.497	.668	1.497	.668	1.497	.668	1.497	.668	1.497
Car use	.873	1.146	.873	1.146	.873	1.146	.873	1.146	.873	1.146
Digital skills	.729	1.372	.729	1.372	.729	1.372	.729	1.372	.729	1.372
Gender	.924	1.082	.924	1.082	.924	1.082	.924	1.082	.924	1.082
Migration background	.904	1.107	.904	1.107	.904	1.107	.904	1.107	.904	1.107
Age	.821	1.218	.821	1.218	.821	1.218	.821	1.218	.821	1.218

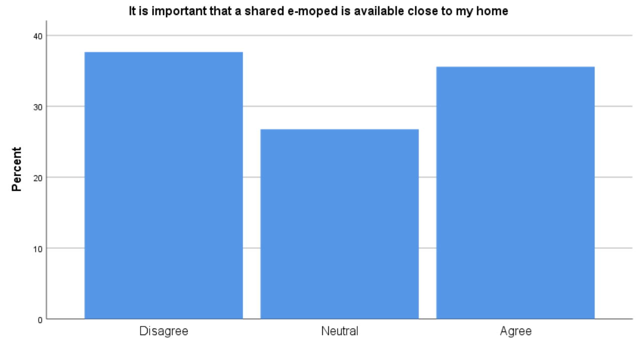
Appendix I. Response frequencies of multimodal trip statements using a 3-point Likert-scale



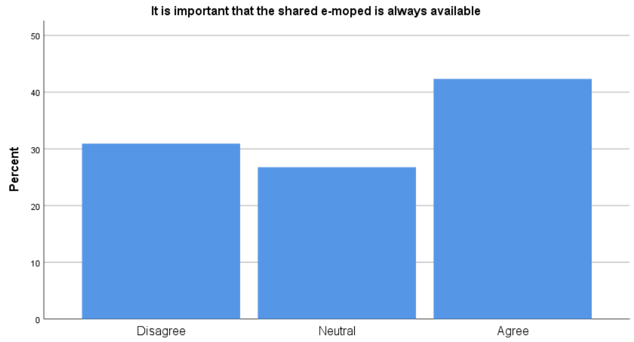
(a) Travel time [N = 393]
Disagree (N=28; 7.1%), Neutral (N=84; 21.4%), Agree (N=281; 71.5%)



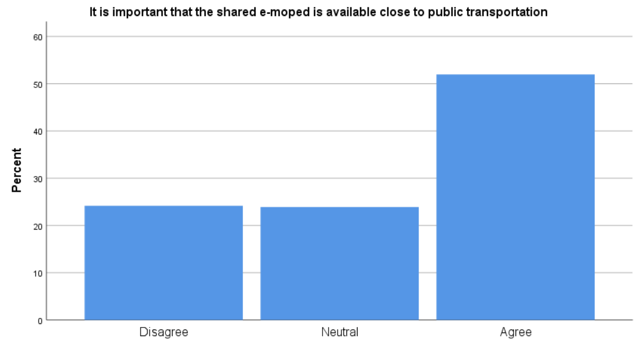
(b) Travel cost [N = 393]
Disagree (N=29; 7.4%), Neutral (N=64; 16.3%), Agree (N=300; 76.3%)



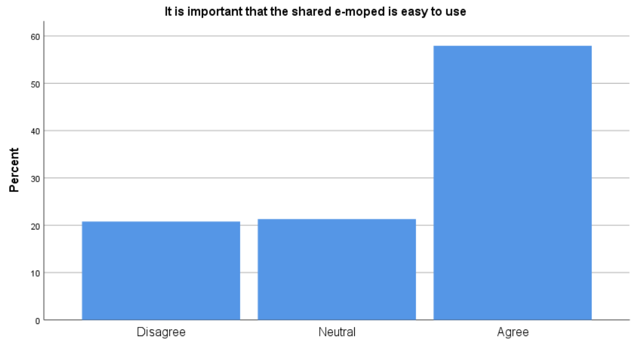
(c) Distance to shared e-moped [N = 385]
Disagree (N=145; 37.7%), Neutral (N=103; 26.8%), Agree (N=137; 35.6%)



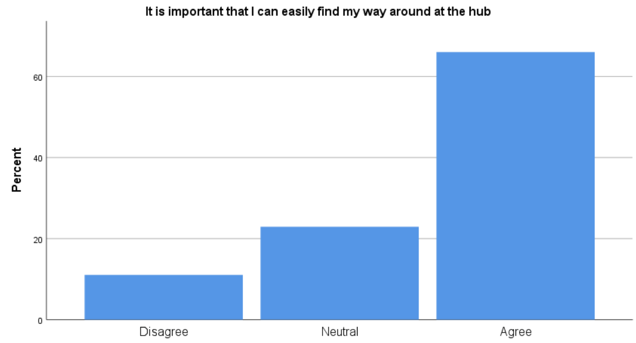
(d) Availability of the shared e-moped [N = 385]
Disagree (N=119; 30.9%), Neutral (N=103; 26.8%), Agree (N=163; 42.3%)



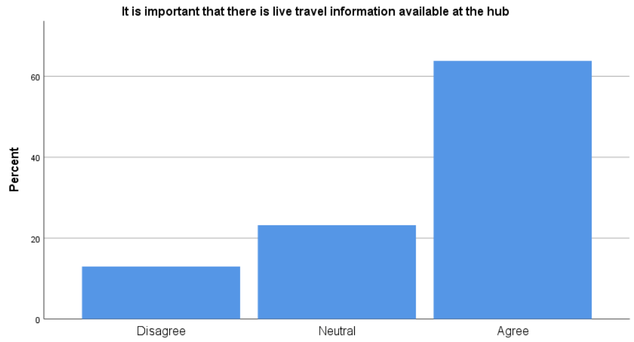
(e) Availability of shared e-moped close to PT [N = 385]
Disagree (N=93; 24.2%), Neutral (N=92; 23.9%), Agree (N=200; 51.9%)



(f) Shared e-moped is easy to use [N = 385]
Disagree (N=80; 20.8%), Neutral (N=82; 21.3%), Agree (N=223; 57.9%)

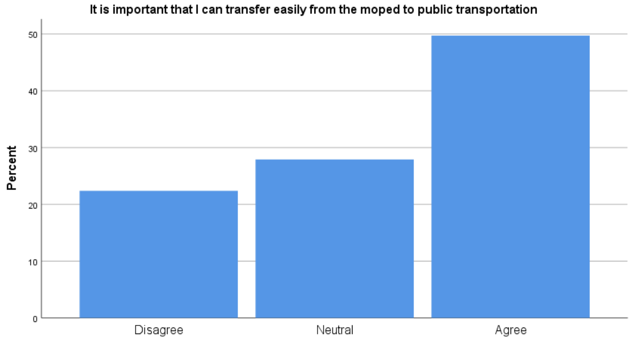


(g) Wayfinding at the mobility hub [N = 362]
Disagree (N=40; 11.0%), Neutral (N=83; 22.9%), Agree (N=239; 66.0%)

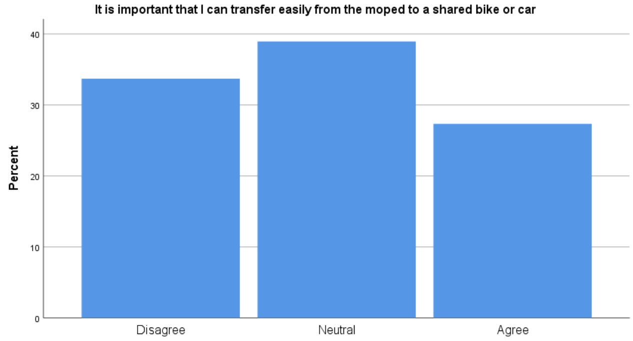


(h) Availability of live travel information at the mobility hub [N = 362]
Disagree (N=47; 13.0%), Neutral (N=84; 23.2%), Agree (N=231; 63.8%)

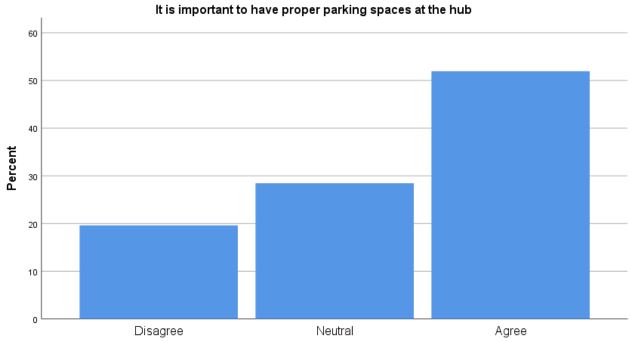
Figure I.7. **Aggregated frequencies of responses to multimodal trip responses.** Strongly disagree & agree is aggregated to disagree, Strongly agree and agree is aggregated to agree.



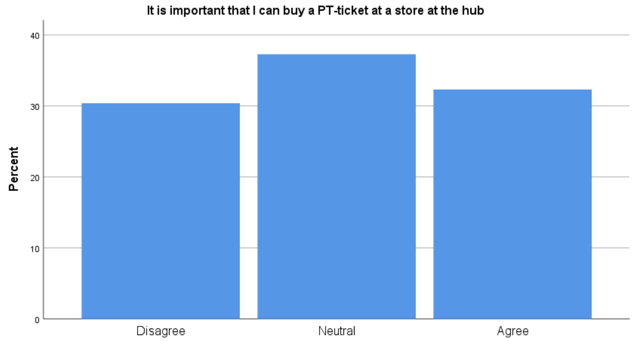
(i) Transfer from shared e-moped to PT [N = 362]
Disagree (N=81; 22.4 %), Neutral (N=101; 27.9%), Agree (N=180; 49.7%)



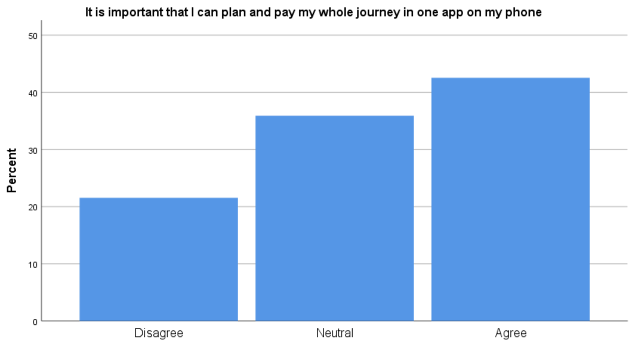
(j) Transfer from shared e-moped to shared bike or car [N = 362]
Disagree (N=122; 7.4%), Neutral (N=141; 16.3%), Agree (N=99; 27.3%)



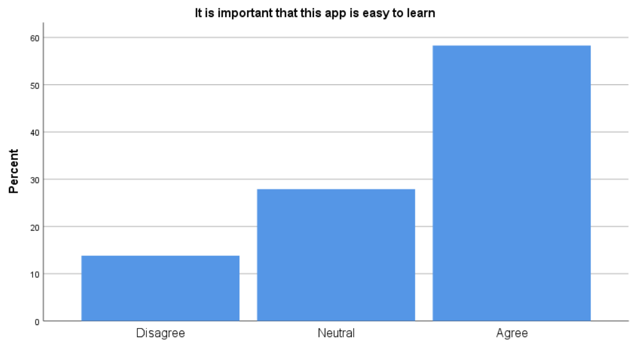
(k) Parking spaces at the mobility hub [N = 362]
Disagree (N=71; 19.6%), Neutral (N=103; 28.5%), Agree (N=188; 51.9%)



(l) Ticket store at the mobility hub [N = 362]
Disagree (N=110; 30.4%), Neutral (N=135; 37.3%), Agree (N=117; 32.3%)



(m) Plan and pay in one mobile application [N = 362]
Disagree (N=78; 21.5%), Neutral (N=130; 35.9%), Agree (N=154; 42.5%)



(n) Multimodal app is easy to learn [N = 362]
Disagree (N=50; 13.8%), Neutral (N=101; 27.9%), Agree (N=211; 58.3%)

Figure I.7. (continued). Aggregated frequencies of responses to multimodal trip responses. Strongly disagree & agree is aggregated to disagree, Strongly agree and agree is aggregated to agree.

Appendix J. Ordinal Logistic Regression for intention to use a shared e-moped at a mobility hub

An ordinal logistic regression with proportional odds was run to determine the effect of the independent variables on the behavioural intention to use a shared e-moped at a mobility hub. First, the assumptions of the model have been validated (see Table J.15). The deviance goodness-of-fit test shows that the model was a good fit to the data (χ^2 = 453.6, p =1.000). However, the Pearson goodness-of-fit indicated that the model was not a proper fit (χ^2 = 650.3, $p < 0.05$) and could be improved but the goodness-of-fit results should be treated with suspicion since a large fraction of cells had zero frequencies (66.6%). In the end, the final model statistically significantly predicted the dependent variable better than the intercept-only model, $\chi^2(25)$ = 455.03, $p < 0.001$.

Table J.15. Model fitting information, Goodness-of-fit statistics and pseudo R-square statistics. Dependent variable: Intention to use a shared e-moped at a mobility hub (N = 400).

Model fit information	**-2LL**	**Chi-square**	**Sig.**
Intercept only	597.409		
Final	455.025	142.383	0.000
Goodness-of-Fit	**Chi-square**	**Sig.**	
Pearson	650.313	0.024	
Deviance	453.639	1.000	
Pseudo R-square	**value**		
Cox and Snell	0.373		
Nagelkerke	0.434		
McFadden	0.238		

The assumption of proportional odds was met (see Table J.16) as indicated by the full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters (χ^2 = 23.14, p = 0.569).

Table J.16. Test of parallel lines results. Link function: logit

Test of parallel lines	**-2LL**	**Chi-square**	**df.**	**Sig.**
Null Hypothesis	455.025			
General	431.885[a]	23.140[b]	25	0.569

Note: [a] The log-likelihood value cannot be further increased after maximum of step-halving; [b] The chi square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.

A selection of independent variables used in the ordinal regression model have more than two categories, i.e., polytomous variables. Table J.17 test whether these variables are statistically significant overall. From the results, it can be concluded that *transfer to PT at Hub* (χ^2 = 7.317, p = 0.026), *social influence* (χ^2 = 11.483, p = 0.003), *educational level* (χ^2 = 7.909, p = 0.019) and *digital skills level* (χ^2 = 7.057, p = 0.029) are statistically significant variables, and therefore their coefficients can be examined.

Table J.17. Omnibus Wald statistical test of polytomous independent variables. Link function: Logit.

	Type III		
	Wald Chi-square	**df.**	**Sig.**
Travel time	1.277	2	0.528
Travel costs	3.131	2	0.209
Transfer to PT at Hub	7.317	2	0.026*
Multimodal planner application	0.890	2	0.641
Social influence	11.483	2	0.003*
Education level	7.909	2	0.019*
Digital skills level	7.057	2	0.029*
Age category	3.158	5	0.676

Note: * parameter is significant at (at least) the 0.05 level

The full output and parameter estimates of the ordinal logistic regression coefficients are shown in Table J.18.

Table J.18. **Parameter estimates of the ordinal logistic regression model.** Dependent variable: Intention to use a shared e-moped at a mobility hub (N = 400).

						95% confidence interval	
	b	**Std. error**	**Wald**	**Sig.**	**Exp(b)**	**Lower**	**Upper**
Threshold							
Intention to use a shared e-moped = disagree	-1.884	1.015	3.449	0.063	0.152	0.021	1.110
Intention to use a shared e-moped = neutral	-0.175	1.006	0.030	0.862	0.839	0.117	6.024
Locations							
Shared e-moped supply factors (C1)	0.593	0.217	7.482	0.006*	1.810	1.183	2.768
Mobility hub facilities (C2)	0.169	0.179	0.893	0.345	1.184	0.834	1.681
Travel time = disagree	0.349	0.576	0.368	0.544	1.418	0.458	4.387
Travel time = neutral	-0.331	0.385	0.743	0.389	0.718	0.338	1.525
Travel time = agree	0[a]				1		
Travel costs = disagree	0.679	0.582	1.363	0.243	1.972	0.631	6.167
Travel costs = neutral	0.586	0.392	2.237	0.135	1.796	0.834	3.870
Travel costs = agree	0[a]				1		
Transfer to PT at Hub = disagree	-1.304	0.571	5.213	0.022*	0.271	0.089	0.831
Transfer to PT at Hub = neutral	-0.892	0.397	5.052	0.025*	0.410	0.188	0.892
Transfer to PT at Hub = agree	0[a]				1		
Multimodal planner application = disagree	-0.418	0.515	0.658	0.417	0.659	0.240	1.807
Multimodal planner application = neutral	-0.234	0.322	0.528	0.468	0.791	0.421	1.488
Multimodal planner application = agree	0[a]				1		
Social influence = disagree	-1.771	0.576	9.444	0.002*	0.170	0.055	0.527
Social influence = neutral	-1.061	0.655	2.623	0.105	0.346	0.096	1.250
Social influence = agree	0[a]				1		
Educational level = low	1.300	0.484	7.217	0.007*	3.669	1.421	9.471
Educational level = medium	0.425	0.295	2.072	0.150	1.529	0.858	2.726
Educational level = high	0[a]				1		
Shared mobility use = no	-0.469	0.385	1.481	0.224	0.626	0.294	1.331
Shared mobility use = yes	0[a]				1		
Car use = no	-0.092	0.319	0.084	0.772	0.912	0.488	1.702
Car use = yes	0[a]				1		
Digital skills level = Level 0 or Level 1	-1.351	0.518	6.808	0.009*	0.259	0.094	0.714
Digital skills level = Level 2	-0.586	0.336	3.049	0.081	0.557	0.288	1.074
Digital skills level = Level 3	0[a]				1		
Gender = Male	0.086	0.287	0.091	0.763	1.090	0.622	1.912
Gender = Female	0[a]				1		
Migration background = Dutch	0.422	0.632	0.444	0.505	1.524	0.441	5.266
Migration background = non-Dutch	0[a]				1		
Age category = 18-24 years	0.243	0.544	0.200	0.655	1.275	0.439	3.706
Age category = 25-34 years	-0.119	0.538	0.049	0.825	0.888	0.310	2.548
Age category = 35-44 years	0.364	0.497	0.537	0.464	1.440	0.543	3.815
Age category = 45-54 years	-0.375	0.542	0.478	0.489	0.687	0.237	1.990
Age category = 55-64 years	0.116	0.484	0.057	0.811	1.123	0.435	2.900
Age category = 65 years or older	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant; * parameter is significant at (at least) the 0.05 level

Appendix K. Ordinal Logistic Regression for intention to use a shared e-moped in combination with bus

An ordinal logistic regression with proportional odds was run to determine the effect of the independent variables on the behavioural intention to use a shared e-moped in combination with a bus. First, the assumptions of the model have been validated (see Table K.19). The deviance goodness-of-fit test shows that the model was a good fit to the data (χ^2 = 320.8, p =1.000). The Pearson goodness-of-fit indicated as well that the model was a proper fit (χ^2 = 551.8, p = 0.802). The goodness-of-fit results should however be treated with suspicion since a large fraction of cells had zero frequencies (66.7%). In the end, the final model statistically significantly predicted the dependent variable better than the intercept-only model, $\chi^2(25)$ = 102.10, $p < 0.001$.

Table K.19. Model fitting information, Goodness-of-fit statistics and pseudo R-square statistics. Dependent variable: Intention to use a shared e-moped in combination with bus (N = 369).

Model fit information	**-2LL**	**Chi-square**	**Sig.**
Intercept only	422.912		
Final	320.814	102.099	0.000
Goodness-of-Fit	**Chi-square**	**Sig.**	
Pearson	551.882	0.802	
Deviance	320.814	1.000	
Pseudo R-square	**value**		
Cox and Snell	0.284		
Nagelkerke	0.379		
McFadden	0.241		

The assumption of proportional odds was not met (see Table K.20) as indicated by the full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters (χ^2 = 302.8, $p < 0.001$). This means that the assumption of proportional odds is violated ($p < 0.05$). Still, the full outcome of the model is shown for clarity.

Table K.20. Test of parallel lines results. Link function: logit

Test of parallel lines	**-2LL**	**Chi-square**	**df.**	**Sig.**
Null Hypothesis	320.814			
General	0.000[a]	302.814	25	0.000

Note: [a] The log-likelihood is practically zero. There may be a complete separation in the data. The maximum likelihood estimates do not exist.

A selection of independent variables used in the ordinal regression model have more than two categories, i.e., polytomous variables. Table K.21 test whether these variables are statistically significant overall. From the results, it can be concluded that *social influence* (χ^2 = 18.247, p < 0.001), *educational level* (χ^2 = 8.999, p = 0.011) and *digital skills level* (χ^2 = 7.122, p = 0.028) are statistically significant variables, and therefore their coefficients can be examined.

Table K.21. Omnibus Wald statistical test of polytomous independent variables. Link function: Logit.

	Type III		
	Wald Chi-square	**df.**	**Sig.**
Travel time	2.484	2	0.289
Travel costs	1.535	2	0.464
Transfer to PT at Hub	3.347	2	0.188
Multimodal planner application	2.131	2	0.345
Social influence	18.247	2	0.000*
Education level	8.999	2	0.011*
Digital skills level	7.122	2	0.028*
Age category	2.753	5	0.738

Note: * parameter is significant at (at least) the 0.05 level

The full output and parameter estimates of the ordinal logistic regression coefficients are shown in Table K.22.

Table K.22. **Parameter estimates of the ordinal logistic regression model.** Dependent variable: Intention to use a shared e-moped in combination with bus (N = 369).

	b	Std. error	Wald	Sig.	Exp(b)	95% confidence interval	
						Lower	Upper
Threshold							
Intention to use a shared e-moped = disagree	-0.055	1.142	0.002	0.961	0.946	0.101	8.875
Intention to use a shared e-moped = neutral	2.127	1.150	3.423	0.064	8.389	0.881	79.845
Locations							
Shared e-moped supply factors (C1)	0.551	0.281	3.843	0.050	1.734	1.000	3.008
Mobility hub facilities (C2)	0.661	0.245	7.258	0.007*	1.936	1.197	3.130
Travel time = disagree	1.152	0.745	2.394	0.122	3.165	0.735	13.620
Travel time = neutral	0.234	0.448	0.274	0.601	1.264	0.525	3.040
Travel time = agree	0[a]				1		
Travel costs = disagree	-0.214	0.783	0.075	0.785	0.808	0.174	3.745
Travel costs = neutral	-0.645	0.523	1.519	0.218	0.525	0.188	1.463
Travel costs = agree	0[a]				1		
Transfer to PT at Hub = disagree	-1.624	0.907	3.209	0.073	0.197	0.033	1.165
Transfer to PT at Hub = neutral	-0.430	0.484	0.789	0.374	0.650	0.252	1.681
Transfer to PT at Hub = agree	0[a]				1		
Multimodal planner application = disagree	-0.915	0.741	1.526	0.217	0.401	0.094	1.711
Multimodal planner application = neutral	0.170	0.384	0.197	0.657	1.186	0.559	2.514
Multimodal planner application = agree	0[a]				1		
Social influence = disagree	-2.175	0.567	14.720	0.000*	0.114	0.037	0.345
Social influence = neutral	-0.960	0.641	2.239	0.135	0.383	0.109	1.346
Social influence = agree	0[a]				1		
Educational level = low	1.581	0.556	8.090	0.004*	4.859	1.635	14.443
Educational level = medium	0.605	0.350	2.981	0.084	1.831	0.921	3.638
Educational level = high	0[a]				1		
Shared mobility use = no	0.235	0.466	0.255	0.614	1.265	0.507	3.156
Shared mobility use = yes	0[a]				1		
Car use = no	0.319	0.374	0.728	0.394	1.376	0.661	2.867
Car use = yes	0[a]				1		
Digital skills level = Level 0 or Level 1	-1.732	0.680	6.486	0.011*	0.177	0.047	0.671
Digital skills level = Level 2	-0.750	0.397	3.566	0.059	0.472	0.217	1.029
Digital skills level = Level 3	0[a]				1		
Gender = Male	-0.024	0.337	0.005	0.942	0.976	0.504	1.889
Gender = Female	0[a]				1		
Migration background = Dutch	0.961	0.798	1.450	0.229	2.615	0.547	12.503
Migration background = non-Dutch	0[a]				1		
Age category = 18-24 years	-0.313	0.634	0.244	0.621	0.731	0.211	2.534
Age category = 25-34 years	-0.775	0.638	1.476	0.224	0.461	0.132	1.609
Age category = 35-44 years	-0.145	0.577	0.063	0.801	0.865	0.279	2.682
Age category = 45-54 years	-0.766	0.645	1.409	0.235	0.465	0.131	1.647
Age category = 55-64 years	-0.214	0.567	0.142	0.707	0.808	0.266	2.456
Age category = 65 years or older	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant; * parameter is significant at (at least) the 0.05 level

Appendix L. Ordinal Logistic Regression for intention to use a shared e-moped in combination with tram

An ordinal logistic regression with proportional odds was run to determine the effect of the independent variables on the behavioural intention to use a shared e-moped in combination with a tram. First, the assumptions of the model have been validated (see Table L.23). The deviance goodness-of-fit test shows that the model was a good fit to the data (χ^2 = 346.9, p =1.000). The Pearson goodness-of-fit indicated as well that the model was a proper fit (χ^2 = 507.5, p = 0.987). The goodness-of-fit results should however be treated with suspicion since a large fraction of cells had zero frequencies (66.6%). In the end, the final model statistically significantly predicted the dependent variable better than the intercept-only model, $\chi^2(25)$ = 121.65, p < 0.001.

Table L.23. Model fitting information, Goodness-of-fit statistics and pseudo R-square statistics. Dependent variable: Intention to use a shared e-moped in combination with tram (N = 369).

Model fit information	**-2LL**	**Chi-square**	**Sig.**
Intercept only	469.929		
Final	348.280	121.650	0.000
Goodness-of-Fit	**Chi-square**	**Sig.**	
Pearson	507.459	0.987	
Deviance	346.893	1.000	
Pseudo R-square	**value**		
Cox and Snell	0.329		
Nagelkerke	0.418		
McFadden	0.258		

The assumption of proportional odds was met (see Table L.24) as indicated by the full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters (χ^2 = 23.14, p = 0.569).

Table L.24. Test of parallel lines results. Link function: logit

Test of parallel lines	**-2LL**	**Chi-square**	**df.**	**Sig.**
Null Hypothesis	348.280			
General	318.806[a]	29.474[b]	25	0.245

Note: [a] The log-likelihood value cannot be further increased after maximum of step-halving; [b] The chi square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.

A selection of independent variables used in the ordinal regression model have more than two categories, i.e., polytomous variables. Table L.25 test whether these variables are statistically significant overall. From the results, it can be concluded that *social influence* (χ^2 = 18.504, p < 0.001), *educational level* (χ^2 = 6.418, p = 0.040) and *digital skills level* (χ^2 = 8.720, p = 0.013) are statistically significant variables, and therefore their coefficients can be examined.

Table L.25. Omnibus Wald statistical test of polytomous independent variables. Link function: Logit.

	Type III		
	Wald Chi-square	**df.**	**Sig.**
Travel time	4.408	2	0.110
Travel costs	1.629	2	0.443
Transfer to PT at Hub	3.904	2	0.142
Multimodal planner application	1.551	2	0.460
Social influence	18.504	2	0.000*
Education level	6.418	2	0.040*
Digital skills level	8.720	2	0.013*
Age category	0.900	5	0.970

Note: * parameter is significant at (at least) the 0.05 level

The full output and parameter estimates of the ordinal logistic regression coefficients are shown in Table L.26.

Table L.26. Parameter estimates of the ordinal logistic regression model. Dependent variable: Intention to use a shared e-moped in combination with tram (N = 369).

						95% confidence interval	
	b	**Std. error**	**Wald**	**Sig.**	**Exp(b)**	**Lower**	**Upper**
Threshold							
Intention to use a shared e-moped = disagree	0.026	1.149	0.001	0.982	1.026	0.108	9.754
Intention to use a shared e-moped = neutral	1.822	1.151	2.507	0.113	6.183	0.648	58.958
Locations							
Shared e-moped supply factors (C1)	0.748	0.283	6.981	0.008*	2.112	1.213	3.679
Mobility hub facilities (C2)	0.382	0.226	2.868	0.090	1.465	0.942	2.280
Travel time = disagree	1.428	0.682	4.382	0.036*	4.171	1.095	15.886
Travel time = neutral	0.067	0.452	0.022	0.883	1.069	0.441	2.593
Travel time = agree	0[a]				1		
Travel costs = disagree	-0.734	0.799	0.846	0.358	0.480	0.100	2.295
Travel costs = neutral	-0.469	0.473	0.984	0.321	0.625	0.247	1.581
Travel costs = agree	0[a]				1		
Transfer to PT at Hub = disagree	-1.691	0.895	3.572	0.059	0.184	0.032	1.065
Transfer to PT at Hub = neutral	-0.521	0.480	1.175	0.278	0.594	0.232	1.523
Transfer to PT at Hub = agree	0.000				1		
Multimodal planner application = disagree	-0.598	0.691	0.749	0.387	0.550	0.142	2.130
Multimodal planner application = neutral	0.247	0.373	0.438	0.508	1.280	0.616	2.660
Multimodal planner application = agree	0[a]				1		
Social influence = disagree	-1.954	0.553	12.494	0.000*	0.142	0.048	0.419
Social influence = neutral	-0.653	0.634	1.062	0.303	0.520	0.150	1.802
Social influence = agree	0[a]				1		
Educational level = low	1.356	0.559	5.874	0.015*	3.879	1.296	11.611
Educational level = medium	0.451	0.338	1.777	0.182	1.570	0.809	3.048
Educational level = high	0[a]				1		
Shared mobility use = no	-0.293	0.434	0.457	0.499	0.746	0.319	1.746
Shared mobility use = yes	0[a]				1		
Car use = no	0.089	0.369	0.058	0.810	1.093	0.530	2.255
Car use = yes	0[a]				1		
Digital skills level = Level 0 or Level 1	-1.477	0.619	5.694	0.017*	0.228	0.068	0.768
Digital skills level = Level 2	-1.011	0.380	7.088	0.008*	0.364	0.173	0.766
Digital skills level = Level 3	0[a]				1		
Gender = Male	-0.092	0.326	0.080	0.778	0.912	0.482	1.727
Gender = Female	0[a]				1		
Migration background = Dutch	1.503	0.813	3.416	0.065	4.497	0.913	22.145
Migration background = non-Dutch	0[a]				1		
Age category = 18-24 years	0.048	0.636	0.006	0.940	1.049	0.302	3.649
Age category = 25-34 years	-0.297	0.629	0.223	0.637	0.743	0.217	2.547
Age category = 35-44 years	0.046	0.586	0.006	0.938	1.047	0.332	3.303
Age category = 45-54 years	-0.259	0.634	0.167	0.682	0.771	0.223	2.673
Age category = 55-64 years	0.061	0.578	0.011	0.916	1.063	0.343	3.300
Age category = 65 years or older	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant; * parameter is significant at (at least) the 0.05 level

Appendix M. Ordinal Logistic Regression for intention to use a shared e-moped in combination with metro

An ordinal logistic regression with proportional odds was run to determine the effect of the independent variables on the behavioural intention to use a shared e-moped in combination with a metro. First, the assumptions of the model have been validated (see Table M.27). The deviance goodness-of-fit test shows that the model was a good fit to the data (χ^2 = 388.2, p =1.000). The Pearson goodness-of-fit indicated as well that the model was a proper fit (χ^2 = 458.4, p = 1.000). The goodness-of-fit results should however be treated with suspicion since a large fraction of cells had zero frequencies (66.6%). In the end, the final model statistically significantly predicted the dependent variable better than the intercept-only model, $\chi^2(25)$ = 166.8, p< 0.001.

Table M.27. Model fitting information, Goodness-of-fit statistics and pseudo R-square statistics. Dependent variable: Intention to use a shared e-moped in combination with metro (N = 369).

Model fit information	**-2LL**	**Chi-square**	**Sig.**
Intercept only	556.315		
Final	389.560	166.755	0.000
Goodness-of-Fit	**Chi-square**	**Sig.**	
Pearson	458.402	1.000	
Deviance	388.174	1.000	
Pseudo R-square	**value**		
Cox and Snell	0.421		
Nagelkerke	0.502		
McFadden	0.299		

The assumption of proportional odds was met (see Table M.28) as indicated by the full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters (χ^2 = 28.44, p= 0.288).

Table M.28. Test of parallel lines results. Link function: logit

Test of parallel lines	**-2LL**	**Chi-square**	**df.**	**Sig.**
Null Hypothesis	389.560			
General	361.125[a]	28.435[b]	25	0.288

Note: [a] The log-likelihood value cannot be further increased after maximum of step-halving; [b] The chi square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.

A selection of independent variables used in the ordinal regression model have more than two categories, i.e., polytomous variables. Table M.29 test whether these variables are statistically significant overall. From the results, it can be concluded that *social influence* (χ^2 = 18.728, p < 0.001) and *digital skills level* (χ^2 = 10.487, p= 0.005) are statistically significant variables, and therefore their coefficients can be examined.

Table M.29. Omnibus Wald statistical test of polytomous independent variables. Link function: Logit.

	Type III		
	Wald Chi-square	**df.**	**Sig.**
Travel time	1.905	2	0.386
Travel costs	0.692	2	0.708
Transfer to PT at Hub	4.487	2	0.106
Multimodal planner application	3.542	2	0.170
Social influence	18.728	2	0.000*
Education level	2.191	2	0.334
Digital skills level	10.487	2	0.005*
Age category	1.262	5	0.939

Note: * parameter is significant at (at least) the 0.05 level

The full output and parameter estimates of the ordinal logistic regression coefficients are shown in Table M.30.

Table M.30. Parameter estimates of the ordinal logistic regression model. Dependent variable: Intention to use a shared e-moped in combination with metro (N = 369).

	b	Std. error	Wald	Sig.	Exp(b)	95% confidence interval	
						Lower	Upper
Threshold							
Intention to use a shared e-moped = disagree	-1.138	1.112	1.047	0.306	0.321	0.036	2.834
Intention to use a shared e-moped = neutral	0.577	1.107	0.272	0.602	1.781	0.203	15.608
Locations							
Shared e-moped supply factors (C1)	0.883	0.262	11.380	0.001*	2.417	1.448	4.037
Mobility hub facilities (C2)	0.078	0.206	0.143	0.705	1.081	0.722	1.618
Travel time = disagree	0.748	0.650	1.325	0.250	2.112	0.591	7.546
Travel time = neutral	-0.258	0.428	0.364	0.547	0.773	0.334	1.787
Travel time = agree	0[a]				1		
Travel costs = disagree	-0.578	0.697	0.689	0.406	0.561	0.143	2.197
Travel costs = neutral	-0.069	0.429	0.026	0.873	0.934	0.403	2.164
Travel costs = agree	0[a]				1		
Transfer to PT at Hub = disagree	-1.569	0.763	4.231	0.040*	0.208	0.047	0.929
Transfer to PT at Hub = neutral	-0.459	0.436	1.110	0.292	0.632	0.269	1.484
Transfer to PT at Hub = agree	0[a]				1		
Multimodal planner application = disagree	-1.157	0.653	3.145	0.076	0.314	0.087	1.129
Multimodal planner application = neutral	-0.360	0.349	1.061	0.303	0.698	0.352	1.384
Multimodal planner application = agree	0[a]				1		
Social influence = disagree	-2.331	0.619	14.180	0.000*	0.097	0.029	0.327
Social influence = neutral	-1.243	0.700	3.153	0.076	0.289	0.073	1.138
Social influence = agree	0[a]				1		
Educational level = low	0.475	0.544	0.762	0.383	1.608	0.554	4.671
Educational level = medium	0.434	0.320	1.832	0.176	1.543	0.823	2.891
Educational level = high	0[a]				1		
Shared mobility use = no	0.044	0.418	0.011	0.916	1.045	0.460	2.374
Shared mobility use = yes	0[a]				1		
Car use = no	0.140	0.347	0.163	0.687	1.150	0.583	2.270
Car use = yes	0[a]				1		
Digital skills level = Level 0 or Level 1	-1.429	0.555	6.633	0.010*	0.239	0.081	0.711
Digital skills level = Level 2	-1.076	0.360	8.960	0.003*	0.341	0.168	0.690
Digital skills level = Level 3	0[a]				1		
Gender = Male	0.069	0.309	0.051	0.822	1.072	0.586	1.962
Gender = Female	0[a]				1		
Migration background = Dutch	1.598	0.744	4.610	0.032*	4.941	1.149	21.241
Migration background = non-Dutch	0[a]				1		
Age category = 18-24 years	-0.200	0.581	0.119	0.731	0.819	0.262	2.557
Age category = 25-34 years	-0.368	0.567	0.422	0.516	0.692	0.228	2.103
Age category = 35-44 years	-0.115	0.530	0.047	0.829	0.892	0.315	2.520
Age category = 45-54 years	-0.490	0.575	0.727	0.394	0.613	0.199	1.889
Age category = 55-64 years	-0.400	0.533	0.563	0.453	0.670	0.236	1.907
Age category = 65 years or older	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant; * parameter is significant at (at least) the 0.05 level

Appendix N. Ordinal Logistic Regression for intention to use a shared e-moped in combination with train

An ordinal logistic regression with proportional odds was run to determine the effect of the independent variables on the behavioural intention to use a shared e-moped in combination with a train. First, the assumptions of the model have been validated (see Table N.31). The Deviance goodness-of-fit test shows that the model was a good fit to the data (χ^2 = 406.4, p =1.000). The Pearson goodness-of-fit indicated as well that the model was a proper fit (χ^2 = 493.5, p = 0.996). The goodness-of-fit results should however be treated with suspicion since a large fraction of cells had zero frequencies (66.6%). In the end, the final model statistically significantly predicted the dependent variable better than the intercept-only model, $\chi^2(25)$ = 176.9, p< 0.001.

Table N.31. Model fitting information, Goodness-of-fit statistics and pseudo R-square statistics. Dependent variable: Intention to use a shared e-moped in combination with train (N = 369).

Model fit information	**-2LL**	**Chi-square**	**Sig.**
Intercept only	584.740		
Final	407.753	176.987	0.000
Goodness-of-Fit	**Chi-square**	**Sig.**	
Pearson	493.535	0.996	
Deviance	406.366	1.000	
Pseudo R-square	**value**		
Cox and Snell	0.440		
Nagelkerke	0.516		
McFadden	0.302		

The assumption of proportional odds was met (see Table N.32) as indicated by the full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters (χ^2 = 24.89, p= 0.468).

Table N.32. Test of parallel lines results. Link function: logit

Test of parallel lines	**-2LL**	**Chi-square**	**df.**	**Sig.**
Null Hypothesis	407.753			
General	382.861[a]	24.892[b]	25	0.468

Note: [a] The log-likelihood value cannot be further increased after maximum of step-halving; [b] The chi square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.

A selection of independent variables used in the ordinal regression model have more than two categories, i.e., polytomous variables. Table N.33 test whether these variables are statistically significant overall. From the results, it can be concluded that *transfer to PT at Hub* (χ^2 = 6.604, p = 0.037), *social influence* (χ^2 = 8.110, p = 0.017) and *digital skills level* (χ^2 = 14.755, p= 0.001) are statistically significant variables, and therefore their coefficients can be examined.

Table N.33. Omnibus Wald statistical test of polytomous independent variables. Link function: Logit.

	Type III		
	Wald Chi-square	**df.**	**Sig.**
Travel time	2.657	2	0.265
Travel costs	0.918	2	0.632
Transfer to PT at Hub	6.604	2	0.037*
Multimodal planner application	0.219	2	0.897
Social influence	8.110	2	0.017*
Education level	1.094	2	0.579
Digital skills level	14.755	2	0.001*
Age category	3.377	5	0.642

Note: * parameter is significant at (at least) the 0.05 level

The full output and parameter estimates of the ordinal logistic regression coefficients are shown in Table N.34.

Table N.34. Parameter estimates of the ordinal logistic regression model. Dependent variable: Intention to use a shared e-moped in combination with train (N = 369).

	b	Std. error	Wald	Sig.	Exp(b)	95% confidence interval	
						Lower	Upper
Threshold							
Intention to use a shared e-moped = disagree	-1.004	1.053	0.908	0.341	0.366	0.046	2.889
Intention to use a shared e-moped = neutral	0.598	1.051	0.323	0.570	1.818	0.232	14.266
Locations							
Shared e-moped supply factors (C1)	1.098	0.252	18.947	0.000*	3.000	1.829	4.919
Mobility hub facilities (C2)	0.372	0.203	3.363	0.067	1.450	0.975	2.157
Travel time = disagree	0.985	0.626	2.478	0.115	2.677	0.786	9.125
Travel time = neutral	-0.085	0.411	0.043	0.836	0.918	0.410	2.055
Travel time = agree	0[a]				1		
Travel costs = disagree	0.339	0.660	0.265	0.607	1.404	0.385	5.114
Travel costs = neutral	0.372	0.429	0.755	0.385	1.451	0.627	3.362
Travel costs = agree	0[a]				1		
Transfer to PT at Hub = disagree	-1.738	0.689	6.354	0.012*	0.176	0.046	0.679
Transfer to PT at Hub = neutral	-0.503	0.417	1.456	0.227	0.605	0.267	1.369
Transfer to PT at Hub = agree	0[a]				1		
Multimodal planner application = disagree	-0.150	0.565	0.070	0.791	0.861	0.284	2.607
Multimodal planner application = neutral	0.102	0.342	0.088	0.766	1.107	0.566	2.163
Multimodal planner application = agree	0[a]				1		
Social influence = disagree	-1.294	0.586	4.866	0.027*	0.274	0.087	0.866
Social influence = neutral	-0.432	0.681	0.402	0.526	0.649	0.171	2.468
Social influence = agree	0[a]				1		
Educational level = low	0.317	0.526	0.363	0.547	1.372	0.490	3.844
Educational level = medium	-0.226	0.313	0.521	0.471	0.798	0.432	1.474
Educational level = high	0[a]				1		
Shared mobility use = no	-0.619	0.409	2.298	0.130	0.538	0.242	1.199
Shared mobility use = yes	0[a]				1		
Car use = no	0.137	0.337	0.165	0.684	1.147	0.593	2.219
Car use = yes	0[a]				1		
Digital skills level = Level 0 or Level 1	-2.045	0.569	12.905	0.000*	0.129	0.042	0.395
Digital skills level = Level 2	-1.040	0.352	8.725	0.003*	0.353	0.177	0.705
Digital skills level = Level 3	0[a]				1		
Gender = Male	0.295	0.303	0.949	0.330	1.343	0.742	2.433
Gender = Female	0[a]				1		
Migration background = Dutch	1.283	0.676	3.604	0.058	3.608	0.959	13.573
Migration background = non-Dutch	0[a]				1		
Age category = 18-24 years	0.087	0.564	0.024	0.878	1.091	0.361	3.297
Age category = 25-34 years	-0.681	0.558	1.490	0.222	0.506	0.169	1.511
Age category = 35-44 years	-0.421	0.524	0.645	0.422	0.657	0.235	1.834
Age category = 45-54 years	-0.310	0.558	0.309	0.578	0.733	0.246	2.189
Age category = 55-64 years	-0.499	0.515	0.939	0.333	0.607	0.221	1.666
Age category = 65 years or older	0[a]				1		

Note: [a] This parameter is set to zero because it is redundant; * parameter is significant at (at least) the 0.05 level

Appendix O. Chi-square test of independence for multimodal trip characteristics between positive and negative intention groups

The multimodal trip characteristics are compared between a group of respondents with a positive intention (N=65) and negative intention (N=234) towards using a shared e-moped at a mobility hub. Positive intention includes responses *strongly agree* and *agree*, negative intention includes *strongly disagree* and *disagree.*

Table O.35. Results of Pearson's Chi-square test of independence and Kendall's tau correlation coefficients between positive and negative intention to use a shared e-moped.

Variable	N	Kendall's tau coeff.	Sig.	Chi-squared value	df.	Asymptotic Sig.
Travel time	292	0.149	0.003	7.627	2	0.022
Travel costs	292	-0.040	0.500	0.839	2	0.657
Distance to SM	286	0.448	<0.001	72.944	2	<0.001*
Availability of SM	286	0.407	<0.001	60.451	2	<0.001*
Availability of SM at PT	286	0.381	<0.001	50.747	2	<0.001*
Ease of use SM	286	0.346	<0.001	42.610	2	<0.001*
Wayfinding Hub	268	0.246	<0.001	17.618	2	<0.001*
Live travel info Hub	268	0.099	0.078	3.546	2	0.170
Transfer PT	268	0.436	<0.001	66.517	2	<0.001*
Transfer Shared mob.	268	0.324	<0.001	43.083	2	<0.001*
Parking Hub	268	0.250	<0.001	20.705	2	<0.001*
Ticket store Hub	268	0.041	0.497	3.413	2	0.182
Multimodal planner App	268	0.381	<0.001	48.590	2	<0.001*
Ease of learn App	268	0.287	<0.001	25.288	2	<0.001*

Note: * significant relation based on Chi-squared value, $p < 0.05$

Appendix P. Cluster analysis to distinguish differences between user groups on the two components

A k-means clustering analysis is performed to see if there are differences between user groups and how they value the specific moped and hub factors. Two variables are included in the model: (i) *importance of shared e-moped supply factors* [-1.92 1.31] and (ii) *importance of mobility hub facilities* [-2.57 1.43]. Four clusters will be determined in the k-means clustering analysis, since initial runs showed that this would lead to distinct clusters. Sample size is large enough (N = 362), multicollinearity is not an issue because this was already checked before and outliers have been removed. The analysis leads to the final four cluster centres as discussed in Table P.36, with their cluster means compared in Figure P.8.

Table P.36. Final cluster means.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Shared e-moped supply factors	0.27421	0.78341	-1.36907	-1.10607
Mobility hub facilities factors	-0.62338	0.66533	-1.97170	0.43913
Number of respondents per cluster	*91*	*151*	*40*	*80*

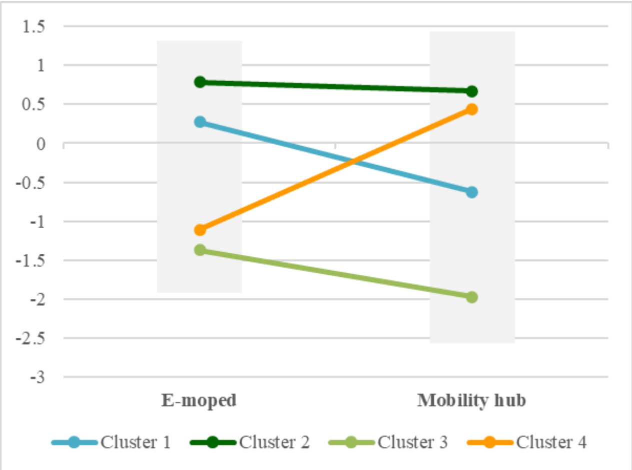


Figure P.8. Comparison of cluster means. Light grey shows the possible range of the two components.

Based on Table P.36. and Figure P.8, the clusters can be interpreted as follows:

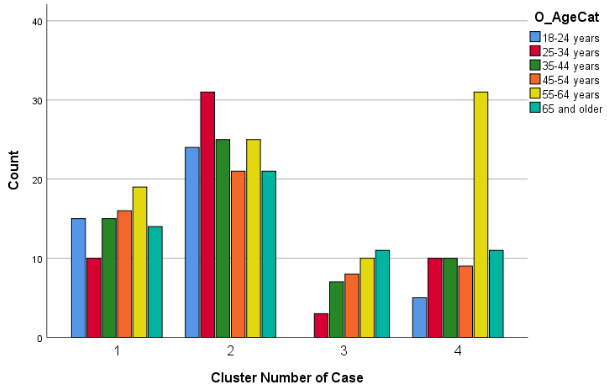
1. Cluster 1 – Respondents who value the e-moped supply factors more than mobility hub factors
2. Cluster 2 – Respondents who strongly value both e-moped supply factors as well as hub facilities
3. Cluster 3 – Respondents who do not value any of the variables strongly
4. Cluster 4 - Respondents who value the mobility hub facilities more important than e-moped supply factors

Based on a Pearson chi-square statistic of independence (Table P.37) it is found that *age*, *digital skills*, *car use* and *shared mobility use* significantly differ across the clusters. When looking at Figure P.9, it can be seen that Cluster 4 has a larger share of older age groups and a lower expected count on shared mobility users while Cluster 2 has a larger expected count of Level 3 digital skills and current car users. Cluster 1 and 3 do not different that much between count and expected count.

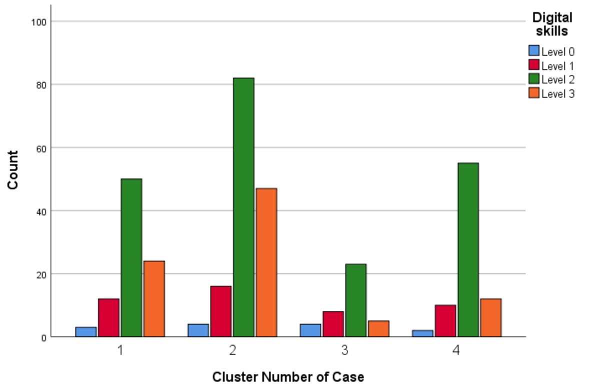
Table P.37. Results of Pearson's Chi-square test of independence for clusters.

Factors	N	Chi-square value	Df.	Asymptotic Sig.
Gender	349	2,229	3	0,526
Educational level	347	8,785	6	0,186
Income level	254	5,513	6	0,480
Age category	351	34,332	15	0,003*
Driver's license	348	8,511	6	0,203
Digital skill level	357	17,610	9	0,040*
Car use	361	9,090	3	0,028*
Shared mobility use	362	10,854	3	0,013*

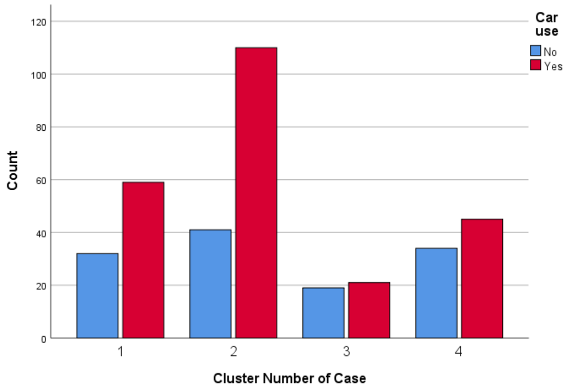
Note: * significant relation, $p < 0.05$



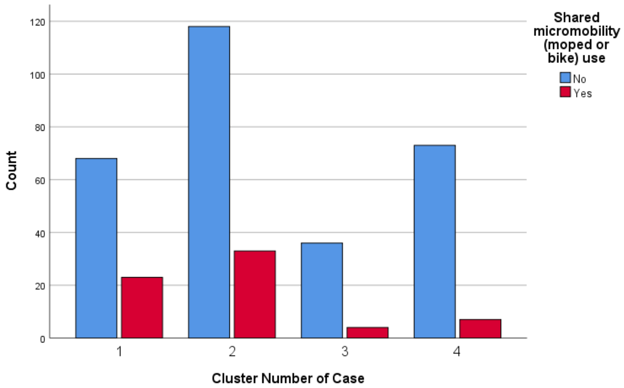
(a) Age category count per cluster.



(b) Digital skills level count per cluster.



(c) Car use count per cluster.



(d) Shared mobility count per cluster.

Figure P.9. Bar graphs of significant independent variables category counts per cluster case.