FUTURE OF TRANSPORT TECHNOLOGY

Leading Indicators of Change

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for Ministry of Transport
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Executive Summary

Key Findings:

- A clear picture of where electric vehicles (electric cars, hybrid cars, electric bikes) and self-driving cars are on the adoption curve, as well as the identification of their key barriers and enablers has been collected, using a survey in November 2016.
- To understand the leading indicators of change, a series that had been developed for the Ministry of Transport was administered to this sample of New Zealanders. The questions cover subjects' awareness, knowledge, attractiveness and use of new transport technologies.
    - The majority of subjects were aware of the transport technologies discussed.
    - Electric vehicles were all around the midpoint on the scale when it came to knowledge, self-driving cars were below it.
    - For attractiveness, electric vehicles were all above the midpoint, whereas self-driving cars were below it.
    - Usage rates of these technologies were low among subjects.
    - Most subjects would feel unsafe travelling in a self-driving car, with 35.3% of subjects selecting the low point on the scale - 'extremely unsafe'.
- Residents of Auckland were more likely to feel safe and be receptive to self-driving cars than other regions.
- The cost of electric cars was the biggest barrier selected by a large margin, and having enough money was the biggest enabler.
- Safety was the most cited barrier (51%) to the adoption of self-driving cars and a large enabler of adoption as well - 38% of respondents cited safety as the biggest enabler.
- Public discussion via stuff comments tended to follow these trends, with one outlier being concern over the economic impact of these technologies on the transport industry. This was present for both commercial and public transport.

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Chapter 1 – Reading the report

This document reports on the Transport Technologies section of the Ministry of Transport's Leading Indicators of Change work. The research is designed to understand public attitudes towards new and upcoming transport technologies and seeks to illustrate them within the framework of the stages of adoption. Four different dimensions associated with adoption are investigated, these are: Awareness, Knowledge, Attractiveness, and Use. Barriers and enablers to adoption were also investigated and analysed. The transport technologies are separated into two sections, electric vehicles and self-driving vehicles, as electric vehicles are a more established technology.

While the term 'autonomous vehicle' is more commonly used within the industry, it was discovered during the development of the questionnaire that subjects were not always aware of what the term entailed. Accordingly, the survey referred to them as self-driving cars, and, therefore, so does this report. The one exception to this rule is Chapter 5, the stuff comments chapter.

In the interests of readability, this report focuses on results that are; a) significant and interesting, or b) interesting because they are not significant. Many other analyses have been run and not reported because they were deemed not to satisfy those criteria.

1.1 – Statistical significance and guidance

Throughout this report 0.05 has been used as the cut off for significance tests in keeping with social science convention.

The relatively low sample size has caused issues for reporting relationships with chi Square cross tabulations when the rule of five is broken – this was particularly common for regional analysis. This problem was mitigated by condensing regional analysis into two separate categories. The first category isolated Auckland and put all other regions into one category – accordingly where this report refers to "other regions", it refers to all areas apart from Auckland being regarded as one group. A second category of regional analysis distinguished between rural and urban areas.

When the terms "more likely" and "less likely" are used in table headings, or in the text, they relate to the result of cross tabulations and the cells which have higher, or lower, than expected values than would have occurred when there is no association between the row and column variables. An adjusted residual value of greater than 2.0 (absolute value) has been used as the cut off value for reporting more or less likely associations.

Tables contain percentages for responses, not for missing values. This allows comparison across the various response categories with relative ease.

Where correlations are discussed, a weak correlation is defined as between 0.1 and 0.3, moderate as between 0.3 and 0.5, and strong as over 0.5. This is in keeping with social science convention.

A Likert scale was used for all questions relating to knowledge, attractiveness and safety. The scale used was 1-7 where 1 was the low point and 7 the high.

1.2 – Research Methods

The Ministry of Transport provided the data that was analysed based on a survey in November 2016. There was insufficient data for meaningful analysis of differences between focal measures and different levels of education or employment.

Stuff comments subsection

In addition to the survey, comments from three articles on self-driving vehicles from stuff.co.nz were analysed to gain an understanding of the public debate - the views of the vocal minority. No significant statistical information can be inferred from this data, but it is interesting to compare and contrast these views with the survey data. The comments were categorised by whether they were positive or negative in nature and then coded into categories similar to the barriers and enablers section of self-driving cars. Negative comments were associated with barriers, and positive ones with enablers in order to make the comparisons easier.

Chapter 2 – The Sample and Their Groups

The Leading Indicators Transport Technologies survey was sent to a panel of 2,200 people who had previously completed the New Zealand Household Travel Survey and indicated that they would be happy to take part in further research. 614 respondents completed the survey.

2.1 – Demographic Distribution of the Sample

The demographics of the respondents are described below.

Age distribution

The age of respondents is shown in Table 2.1 and compared to the 2013 Census results.
The age range is 15-90. Note that the census percentages relate to the whole population (which is why the census percentage total is 75%) while the sample percentages relate to the sample alone.

Table 2.1: Age of Respondents

Age range	Sample number	Sample percent	2013 Census percent
15-17	13	2.1	N/A
18-24	24	3.9	10
25-34	66	10.7	13
35-44	121	19.7	13
45-54	128	20.8	14
55-64	125	20.4	11
65+	137	22.3	14
Total	614	100	75

Gender of Respondents

The respondents are 48.4% Male (297) and 51.6% Female (317). This result is not very different to the gender distribution of New Zealanders during the 2013 census where males made up 48.7 percent of the population and females made up 51.3 percent (Census QuickStats 2013).

Region of residence

The region of residence of the sample is shown in Table 2.2. Regions were combined into Auckland and Other Regions, which is show in Table 2.3. The rural/urban categorisation is shown in Table 2.4.

Table 2.2: Region of Respondents

Region	Number	Percent
Auckland	170	27.7
Bay of Plenty	45	7.3
Canterbury	90	14.7
Gisborne	5	.8
Hawke's Bay	19	3.1
Manawatu-Wanganui	24	3.9
Nels-Marlb-Tas	19	3.1
Northland	10	1.6
Otago	43	7.0
Southland	23	3.7
Taranaki	16	2.6
Waikato	66	10.7
Wellington	81	13.2
West Coast	3	.5
Total	614	100.0

Table 2.3: Auckland and Other Regions

Region	Number	Percent
Auckland	170	27.7
Other Regions	444	72.3

Table 2.4: Rural/Urban Divide

Region	Number	Percent
Urban	509	82.9
Rural	105	17.1

Ethnicity of the sample

The self-reported ethnicity of the sample is shown in Table 2.5. The category of other is comprised of people mainly from European and unspecified Asian countries, as well as Africa, Fiji and South America.

Table 2.5: Ethnicity of Respondents

Ethnicity	Number	Percentage
New Zealand European	474	77.2
Maori	43	7.0
Samoan	7	1.1
Tongan	2	0.3
Niuean	1	0.2
Chinese	16	2.6
Indian	14	2.3
Other	73	11.9
Total	614	102.6

Chapter 3 - Electric Vehicles

Chapter 3 of this report begins by illustrating the respondents' awareness, knowledge, attractiveness and use of electric cars, hybrid cars and electric bikes - this is then analysed within the framework of the stages of adoption. Barriers and enablers to electric vehicle adoption are then discussed, and finally, other interesting findings are presented.

3.1 – Electric Cars

The majority of subjects had heard about electric cars (98.2%) (see Table 3.1) and men were more likely to self-report having heard of them than women. There was also a significant difference in the mean age (p=<0.032, t=10.445) of those who had heard about electric cars (50.72yr) and those who had not (40.27yr).

Table 3.1: Awareness of Transport Technologies

Question	Yes	No	Percentage
Have you heard about electric cars?	603	11	98.2
Have you heard about hybrid cars?	570	44	92.8
Have you heard about electric bikes?	563	51	91.7
Have you heard about self-driving cars?	580	34	94.5

Knowledge and attractiveness

The mean of the Likert scale used for this series of questions was 3.5. Self-reported knowledge (3.58) and attractiveness (4.24) were both above this in the direction of the high point of the scale (See Figure 3.1). There was a significant difference in mean self-reported knowledge of electric cars (p=<0.001, t=1.07) between men (4.13) and women (3.06) (See Figure 3.2). The same was true for attractiveness (p=<0.001, t=0.662), with men having a sample mean of 4.59, and women 3.92 (See Figure 3.3). With regards to regional differences, there was a significant difference in mean attractiveness of electric cars (p=<0.049, t=0.345) between Auckland (4.49) and the other regions (4.15).

Correlations

There were two statistically significant correlations for electric cars. The first was a positive linear relationship of moderate strength between knowledge and attractiveness (p=<.001, r=.418). This means that as knowledge of electric cars increases, so does attractiveness. The second correlation was a (p=<0.001, r=0.197) statistically significant weak positive linear relationship between income and knowledge of electric cars. As income goes up, so does knowledge of electric cars. It is interesting to note, that all three electric vehicle technology types here show a weak correlation between income and knowledge, but not between income and attractiveness.

Usage

The clear majority of respondents (97.7%) had not used an electric car in the last month.

Figure 3.1 – Knowledge and attractiveness of electric cars

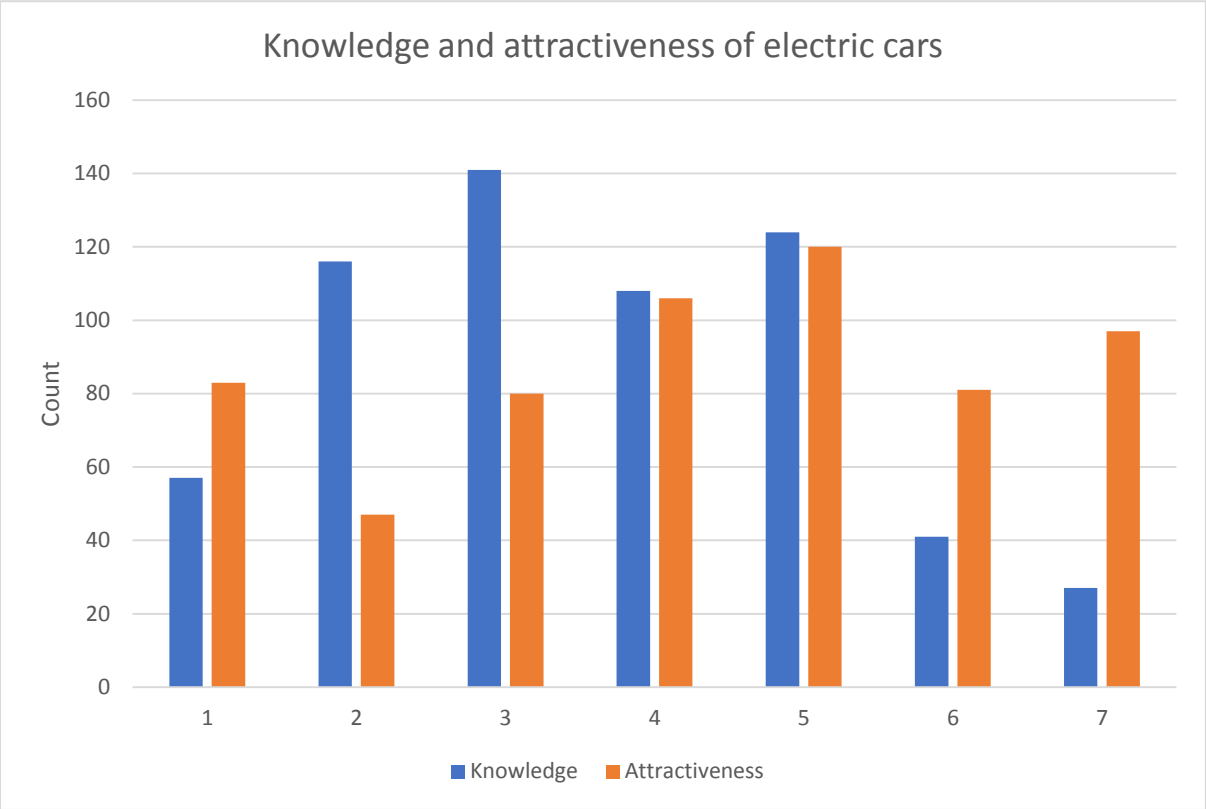


Figure 3.2 – Relationship between knowledge of electric cars and gender

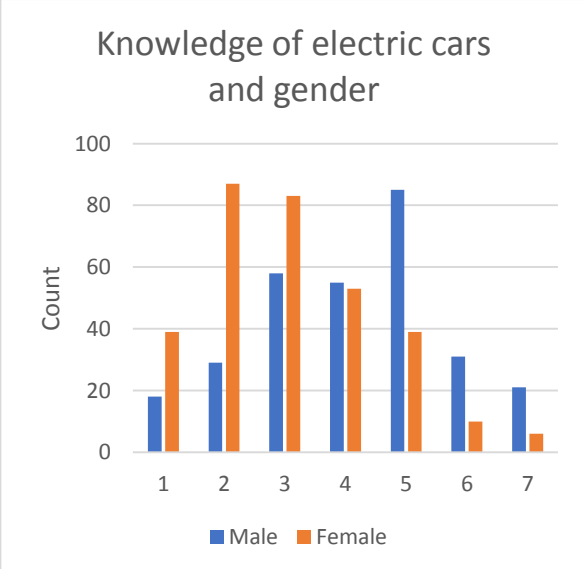
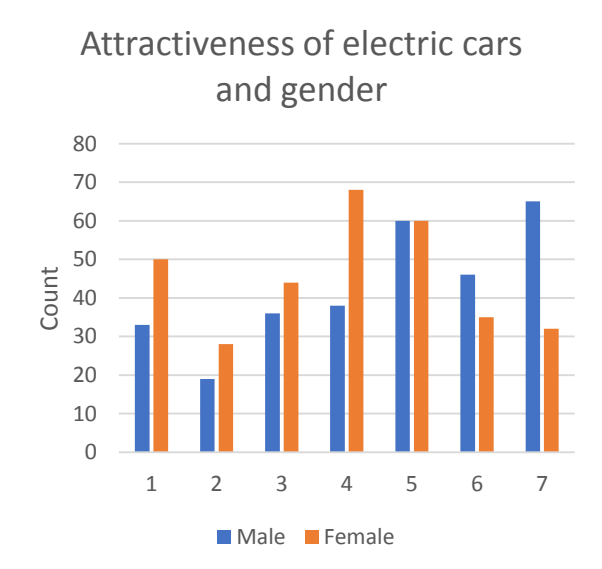


Figure 3.3 – Relationship between attractiveness of electric cars and gender



3.2 – Hybrid cars

The majority of subjects had heard about hybrid cars (92.8%) (see Table 3.1) and men were more likely to self-report having heard of them than women.

Knowledge and attractiveness

Self-reported knowledge (3.52) and attractiveness (3.94) of hybrid cars were, like electric cars, above the mean in the direction of the high point of the scale (See figure 3.4). There was a significant difference in mean self-reported knowledge of hybrid cars (p=<0.01, t=1.38) between men (4.23) and women (2.85) (See Figure 3.5). This was also true for attractiveness (p=<0.01, t=0.466), with men having a sample mean of 4.19 and women 3.72 (See figure 3.6).

Correlation between knowledge and attractiveness

There were three statistically significant correlations for hybrid cars. The first was a positive linear relationship of moderate strength between knowledge and attractiveness (p=<.001, r=.437). The second was a weak positive linear relationship between income and knowledge of hybrid cars (p=<0.001, r=0.284). The third correlation was a weak positive linear relationship between age and attractiveness of hybrid cars (p=<0.012, r=0.103).

Usage

The majority (92.5%) of respondents had not used a hybrid car in the last month, but 35 (5.75%) reported having used one once or twice in the same period. Full results are show in Table 3.2.

Table 3.2: In the last month, how often have you used a hybrid car?

	Frequency	Percentage
Every day/almost everyday	1	0.2
Several times a week	4	0.7
Once a week	6	1.0
Once or twice in the last month	35	5.7
Not used in the last month	568	92.5

Figure 3.4 – Knowledge and attractiveness of hybrid cars

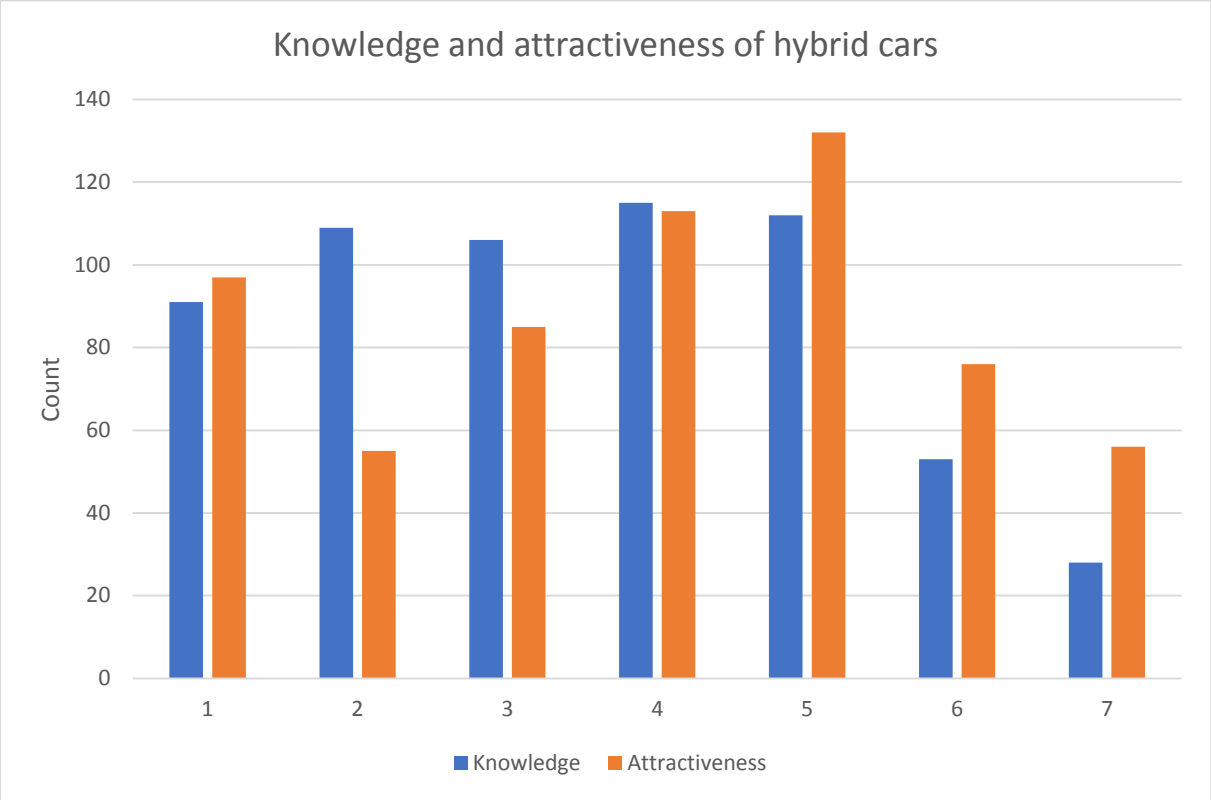


Figure 3.5 – Relationship between knowledge of hybrid cars and gender

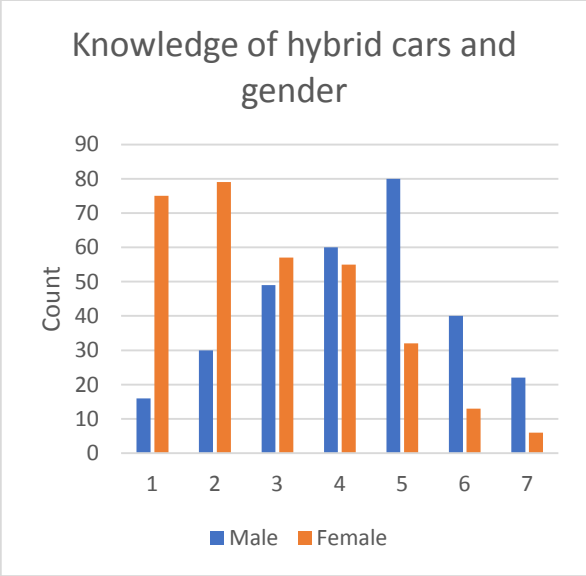
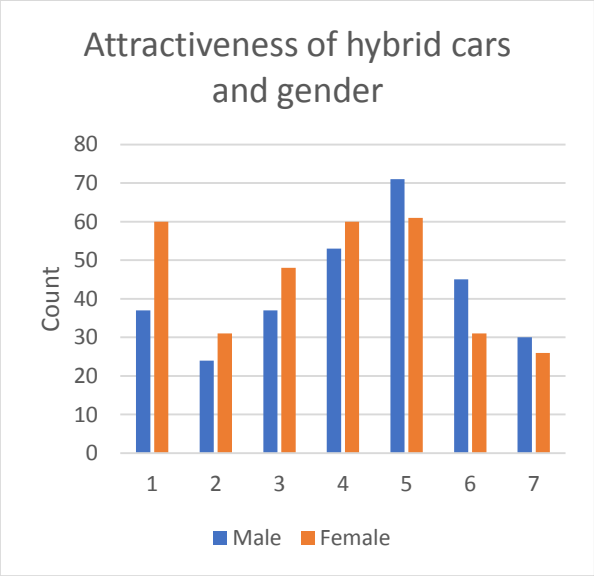


Figure 3.6 – Relationship between attractiveness of hybrid cars and gender



3.3 – Electric Bikes

The majority of subjects had heard about electric bikes (91.7%) (see Table 3.1) and men were more likely to self-report having heard of them than women.

Knowledge and attractiveness

Self-reported knowledge of electric bikes (3.45) was slightly below the midpoint of the scale in direction of the low end, while attractiveness (3.74) remained above it (Figure 3.7). The only interesting demographic relationship for electric bikes was the significant difference in mean self-reported knowledge of electric bikes (p=<0.01, t=0.63) between Men (3.77) and women (3.15) (See Figure 3.8).

Correlations

There were two statistically significant correlations for electric bikes. The first was a strong positive linear relationship between knowledge and attractiveness of electric bikes (p=<.001, r=.509). The second was a weak but statistically significant (p=<0.001, r=0.176) positive linear relationship between income and knowledge of electric bikes.

Usage

The majority (96.6%) of respondents had not used a hybrid car in the last month.

Figure 3.7 – Knowledge and attractiveness of electric bikes

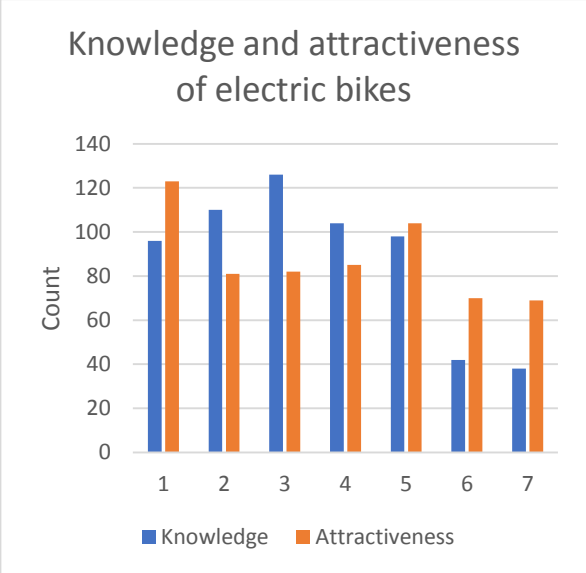
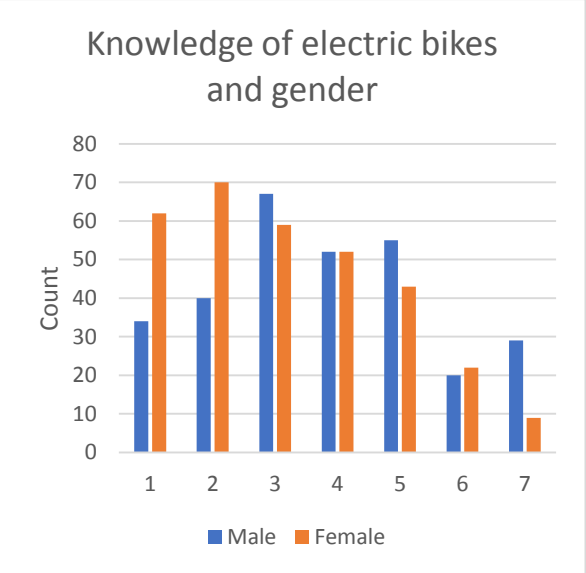


Figure 3.8 – Relationship between knowledge of electric bikes and gender



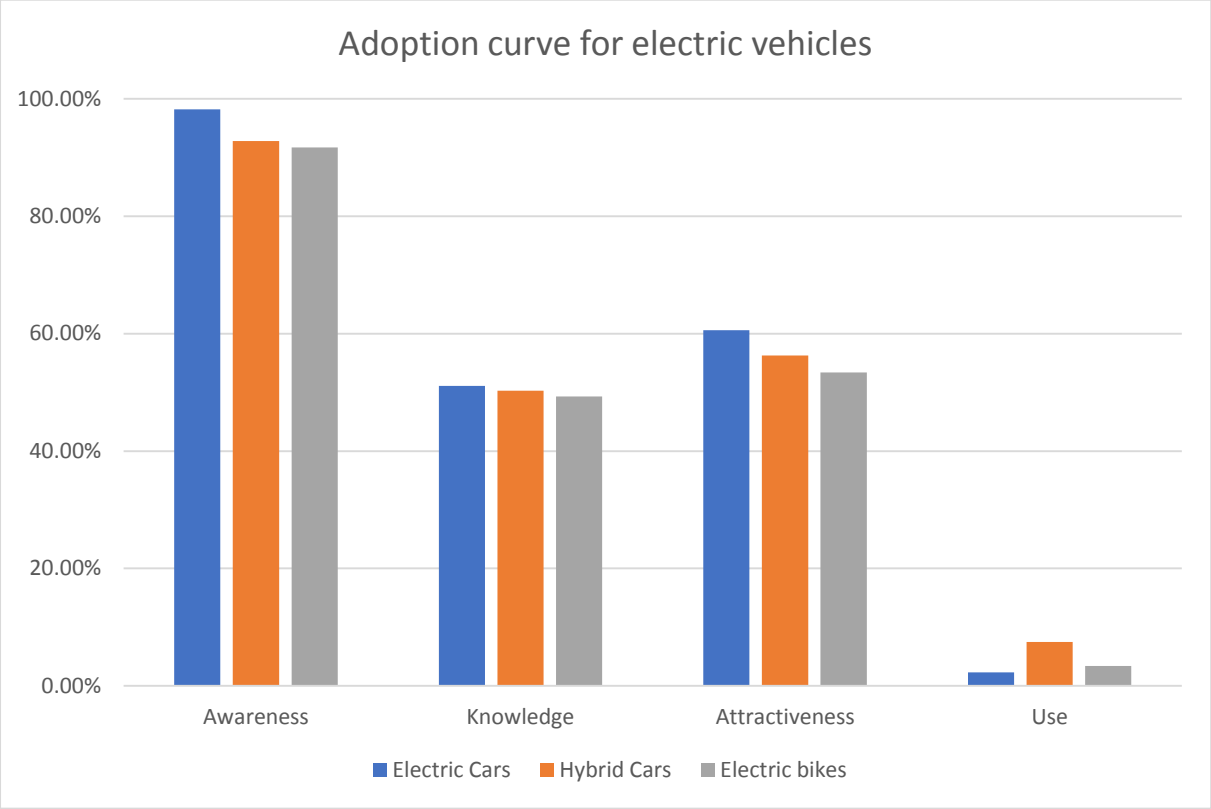
3.4 – Adoption curve for electric vehicles

The method used to analyse these results is the stages of adoption framework, which looked at participant's awareness, knowledge, attractiveness and use of electric vehicles. Figure 3.9 shows the adoption curve for electric cars, hybrid cars and electric bikes.

The pattern electric vehicles follow is all quite similar, use is above 90% for all technologies and knowledge hovers around the mid-point of the scale (3.5), between 3.45 and 3.58. Attractiveness is above knowledge in all cases and ranges from 3.74 to 4.24. As shown earlier, there was a significant correlation between knowledge and attractiveness of all three vehicle technologies. This is represented in these graphs where the highest knowledge value (51.1%) also has the highest attractiveness value (60.6%). This pattern follows all three technologies, hybrid cars were in the middle with 50.3% (knowledge) and 56.3% (attractiveness), and electric bikes were 49.3% (knowledge) and 53.4% (attractiveness).

Actual usage rates were quite low across the board, hybrid cars had the highest usage rages at 7.5%, while electric cars had the lowest usage rate at 2.3%. This differs from the pattern above, and can perhaps be attributed to the fact that hybrid cars have a higher market penetration due to being available for longer.

Figure 3.9 – Adoption curve for electric vehicles



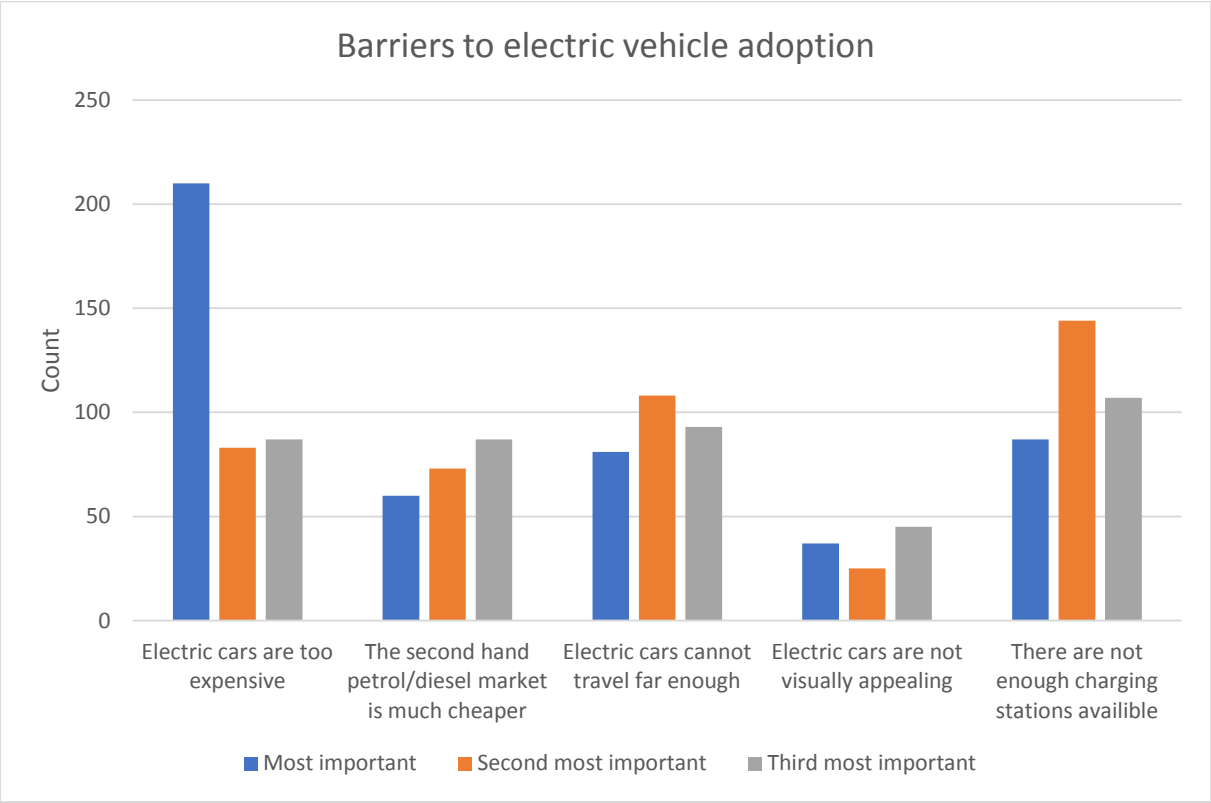
3.5 – Barriers to EV adoption

Cost was the most cited barrier to EV adoption, with 34% of subjects considering it to be the most important barrier and had a collective 61.7% citation rate. This can also further be expanded with a cumulative 35.9% of respondents citing their preference of the second-hand petrol/diesel market due to affordability. The lack of charging stations available also had a significant result, and was most commonly chosen as the second (23.5%) and third (17.4%) most important. It also had the second highest cumulative citation rate behind cost (55.1%). Table 3.3 shows the cumulative citation percentage and Figure 3.10 shows the full results.

Table 3.3: Barriers Cumulative Percentage

	Percentage
Electric cars are too expensive	61.7
There are not enough charging stations available	55.1
Electric cars cannot travel far enough	46.1
The second hand petrol/diesel market is much cheaper	35.9
Electric cars are not visually appealing	17.4

Figure 3.10 – Barriers to EV adoption



3.6 – Enablers for EV adoption

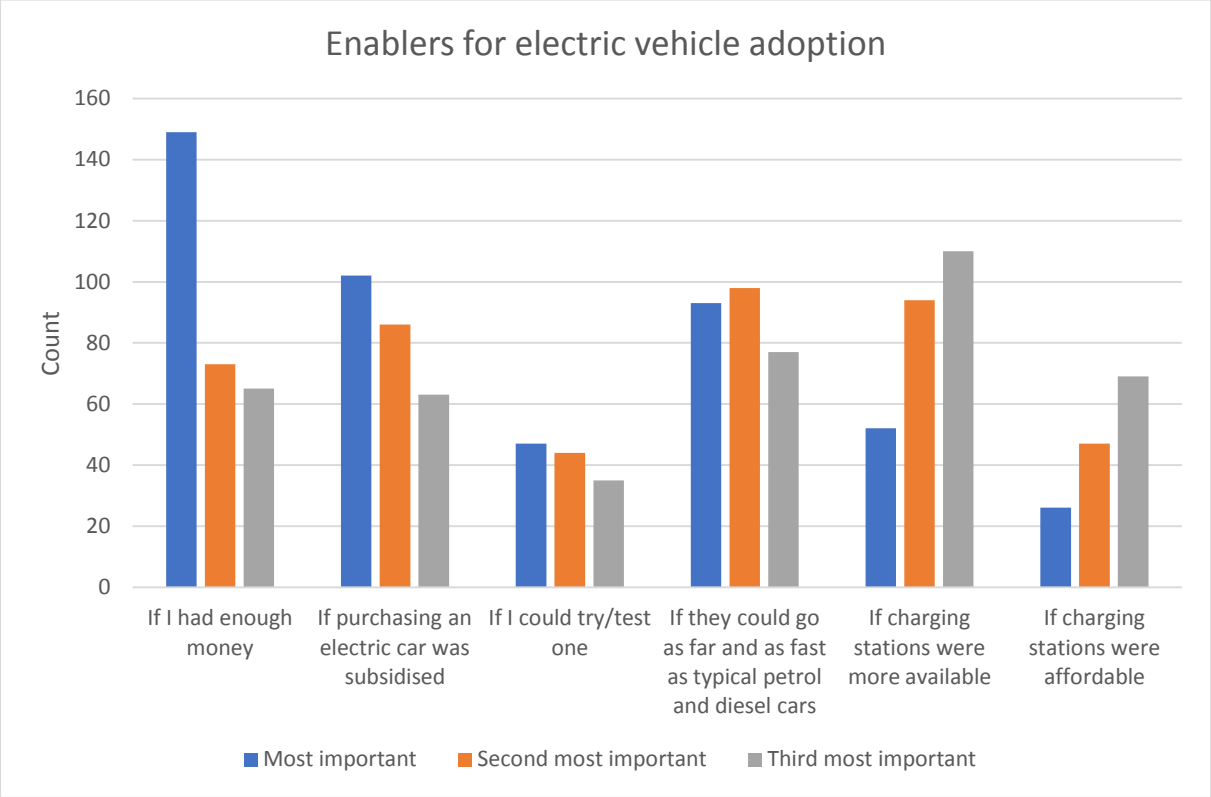
Having enough money was the most common enabler for EV adoption, with the highest 'most important' citations at 24.3%. In the same theme, subsidisation was also commonly chosen as an enabler with a 40.9% cumulative citation rate. There were three other significant results, the first

being the importance of similar of speed and travel distance as conventional cars which had a cumulative citation rate of 43.6%. The second was the important of having charging stations available, which had a cumulative citation rate of 41.7%, and the third significant result was for electric vehicle subsidisation, which had a cumulative citation rate of 40.9%. Figure 3.11 shows the full results, and Table 3.4 shows the cumulative citation percentage. Note that cumulative percentages are lower for enablers, as there were 6 options compared to the 5 for barriers.

Table 3.4: Enablers Cumulative Percentage

	Percentage
If I had enough money	46.8
If they could go as far and as fast as typical petrol and diesel cars	43.6
If charging stations were more available	41.7
If purchasing an electric car was subsidised	40.9
If charging stations were more affordable	23.1
If I could try/test one	20.6

Figure 3.11 – Enablers for EV adoption



3.7 – Other Findings

The first thing of import to discuss here is the result for the question "Do you intend to use a new/emerging transport technology in the next 12 months?" A majority (79.8%) of respondents indicated that they did not intend to, which leaves 20.2% that do – Table 3.5 shows the full results.

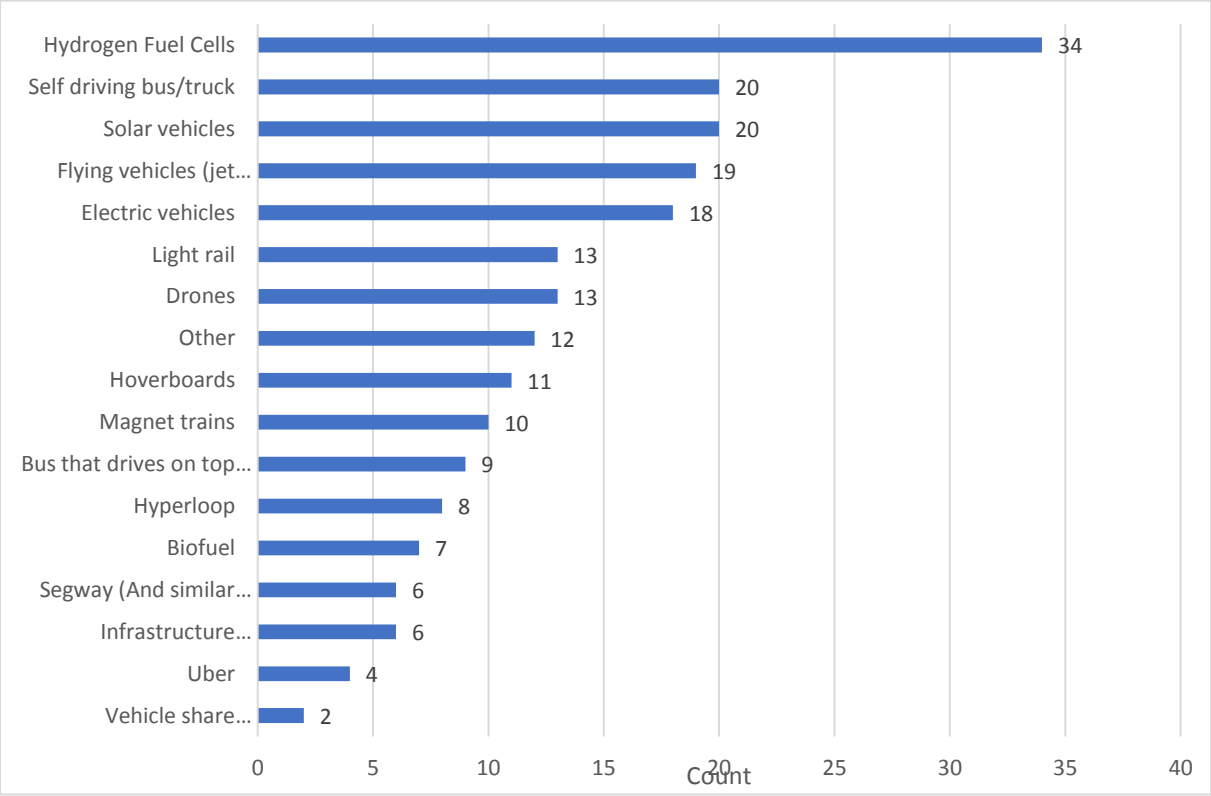
Table 3.5: Intent to use new transport technology in the next 12 months

	Frequency	Percentage
No	490	79.8
Yes	53	8.6
Yes and more than the amount I currently use	24	3.9
Yes and the same amount I currently use	36	5.9
Yes but less than what I currently use	11	1.8

Awareness of other transport technologies

As part of the awareness section, subjects were asked to volunteer any other new and emerging transport technologies they were aware of. A substantial number of subjects (34.5%) responded and the most common responses were hydrogen fuel cells, solar vehicles, and self-driving trucks/busses. Figure 3.14 shows the full results (the electric vehicles category includes vehicles other than cars, such as trucks, trains and buses).

Figure 3.12 – What other emerging transport technologies have you heard about?



Chapter 4 – Self-driving Cars

Chapter four follows a similar structure to chapter three. It illustrates the respondents' awareness, knowledge, attractiveness and use of self-driving cars which is then analysed within the framework of the stages of adoption. An additional question relevant to this section asked how same subjects would feel while travelling in a self-driving car, this was asked on a similar Likert scale to knowledge and attractiveness, and has been added to that section. This is followed by an analysis of the enablers and barriers to self-driving car adoption.

4.1 – Stages of adoption for self-driving cars

Like the electric vehicles section, the majority (94.5%) of subjects were aware of self-driving cars (See Table 3.1), and men were more likely to self-report having heard of them. There was also a significant difference in the mean age (p=<0.017, t=6.79) of those who had heard about self-driving cars (50.91yr) and those who had not (44.12yr).

Knowledge, attractiveness and safety

Self-reported knowledge (2.91) and attractiveness (2.86) differed significantly from electric vehicles, and were both below the scales mean (3.5) in the direction of the low point of the scale. Subjects feelings of safety while travelling in a self-driving car was also below the mean, at 2.8. Figure 4.1 shows the distribution, and a particularly interesting result was that the majority (35.3%) of subjects expressed that they would feel 'extremely unsafe' travelling in a self-driving car.

Like electric vehicles, there was a significant difference in mean knowledge of self-driving cars (p=<0.01, t=1.011) between Men (3.43) and women (2.42). This was true for attractiveness as well (p=<0.01, t=0.549), where men's sample mean was 3.14, women's was 2.60 (Figure 4.2). The pattern also held true for feelings of safety while travelling in a self-driving car (p=<0.01, t=0.753), where the mean for men was 3.19, and 2.44 for women (Figure 4.3).

With regard to regions, there was a significant difference in mean attractiveness of self-driving cars (p=<0.002, t=0.598) between Auckland (3.29) and Other Regions (2.70). This was also true for feelings of safety (p=<0.03, t=0.370) between residents of Auckland (3.07) and Other Regions (2.7).

Correlations

There were several interesting and statistically significant correlations within this section. There was:

1) A strong positive linear relationship between attractiveness of self-driving cars and feelings of safety travelling in one (p=<.001, r=.540).
2) A moderately strong positive linear relationship between knowledge of self-driving cars and feelings of safety travelling in one (p=<.001, r=.267).
3) A moderately strong positive linear relationship between knowledge and attractiveness of self-driving cars (p=<.001, r=.396).
4) A weak positive linear relationship between income and knowledge of self-driving cars (p=<0.002, r=0.155).

5) A weak negative linear relationship between age and attractiveness of self-driving cars (p=<0.001, r=-0.152). Not the direction here, for this one as age increases, attractiveness of self-driving cars decreases.

Figure 4.1 – Knowledge, attractiveness and feelings of safety while travelling in a self-driving car

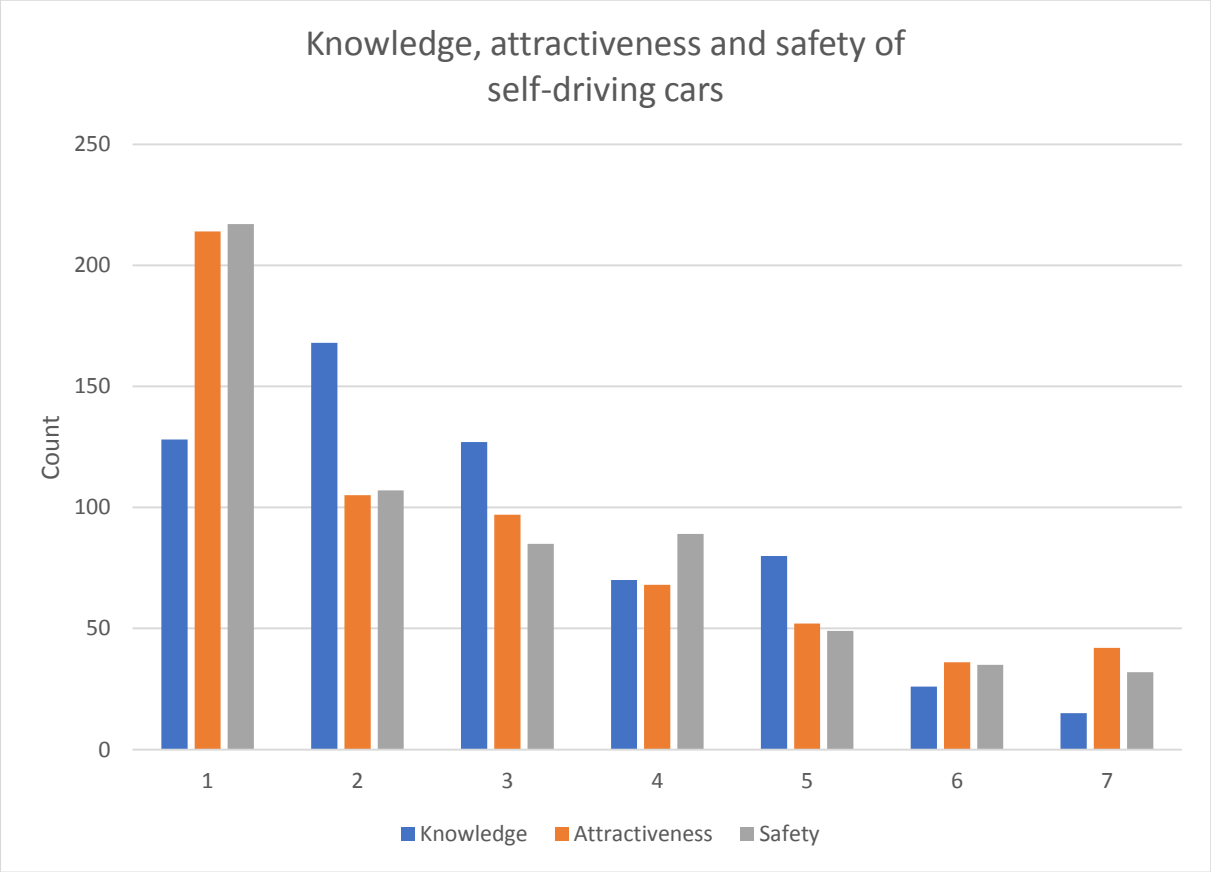
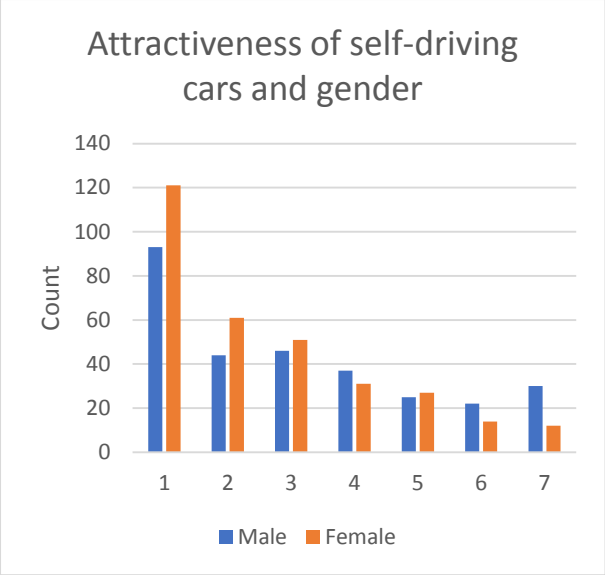
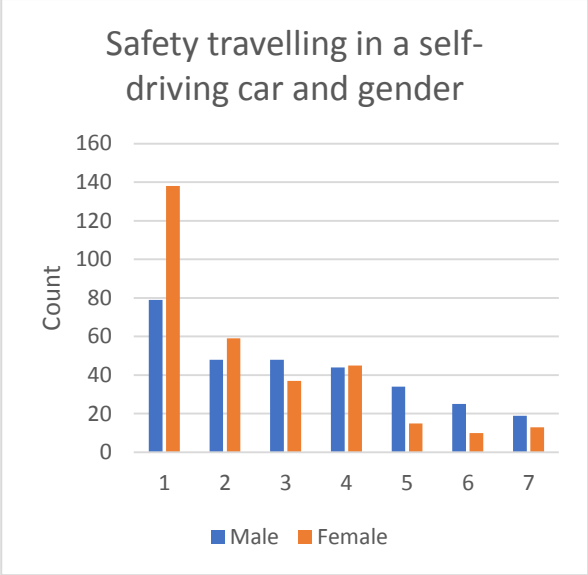


Figure 4.2 – Relationship between gender and attractiveness of self-driving cars

Figure 4.3 – Relationship between gender and feelings of safety while travelling in a self-driving car





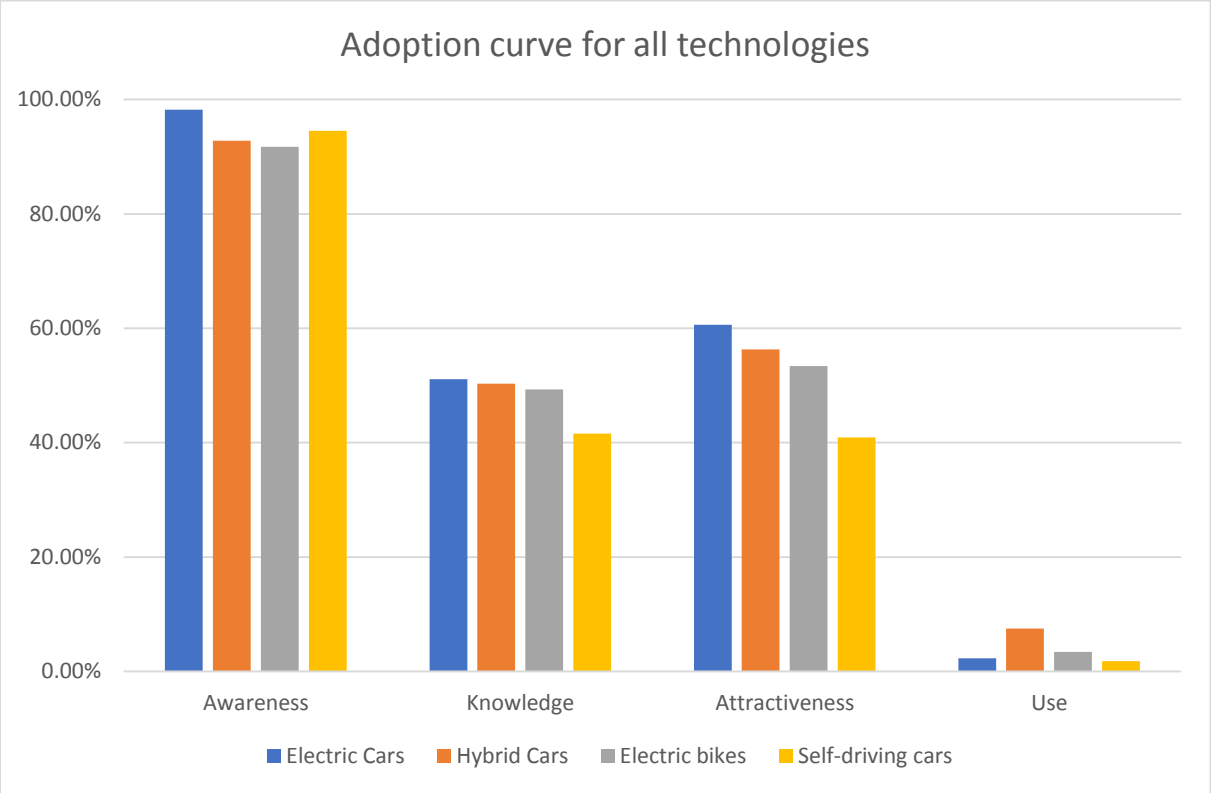
4.2 – Adoption curve for self-driving cars

There are similarities and differences between the adoption curve for electric vehicles and self-driving cars. Awareness was above 90% for all technologies, and use was below 10% for all technologies. While there were small variations here there was no clear pattern between electric vehicles and self-driving cars.

However, this changed when it came to the knowledge and attractiveness sections. Self-reported knowledge of self-driving cars had a sample mean of 2.91 which is quite different to electric cars (3.58), hybrid cars (3.52) and electric bikes (3.45). The pattern held true for attractiveness as well, attractiveness of self-driving cars had a sample mean of 2.86 which was lower than electric cars (4.24), hybrid cars (3.94), and electric bikes (3.74). Figure 4.4 shows the same adoption curve for all four types of vehicle technology discussed, and shows that subjects felt less knowledgeable about self-driving cars and found them less attractive compared to the other future transport technologies discussed.

There was a consistent moderately strong positive linear relationship between knowledge and attractiveness of all technology types discussed, however, which indicates that the pattern of attraction increasing with knowledge will hold for self-driving cars. The current results simply indicate that self-driving cars are simply less far along the adoption curve compared to electric vehicles, most likely due to the technology still being in its infancy.

Figure 4.4 – Adoption curve for all vehicle technologies

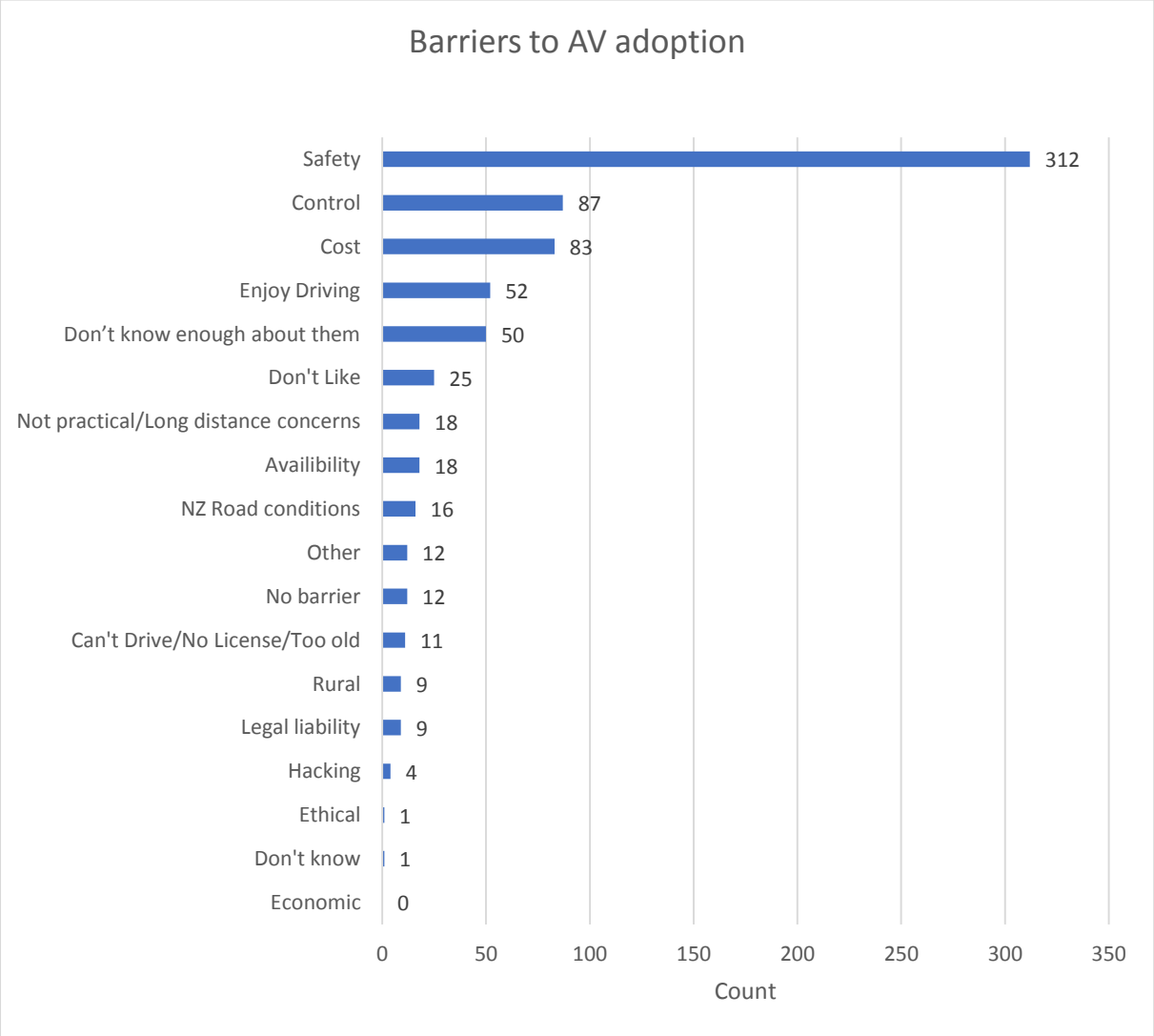


4.2 – Barriers to self-driving car adoption

Safety (50.8%) was by far the most cited barrier to self-driving car adoption, with control (14.1%) and cost (13.5%) being the next two most cited. People from rural areas were more likely to cite rural conditions as a barrier to the adoption of self-driving cars.

The economic issue is separate from cost and was included, despite lacking any citations, as this was a significant departure from the stuff comments (explored below in chapter 5) which cited the economic issues of job losses in the transportation industry as a significant concern. This is an interesting difference, and the reason for it could perhaps be attributed to the wording of the survey questions. Barriers to adoption implies a personal worry, whereas in the stuff article comments, people were more concerned about the wider implications of self-driving vehicle adoption. The full results are shown in figure 4.5.

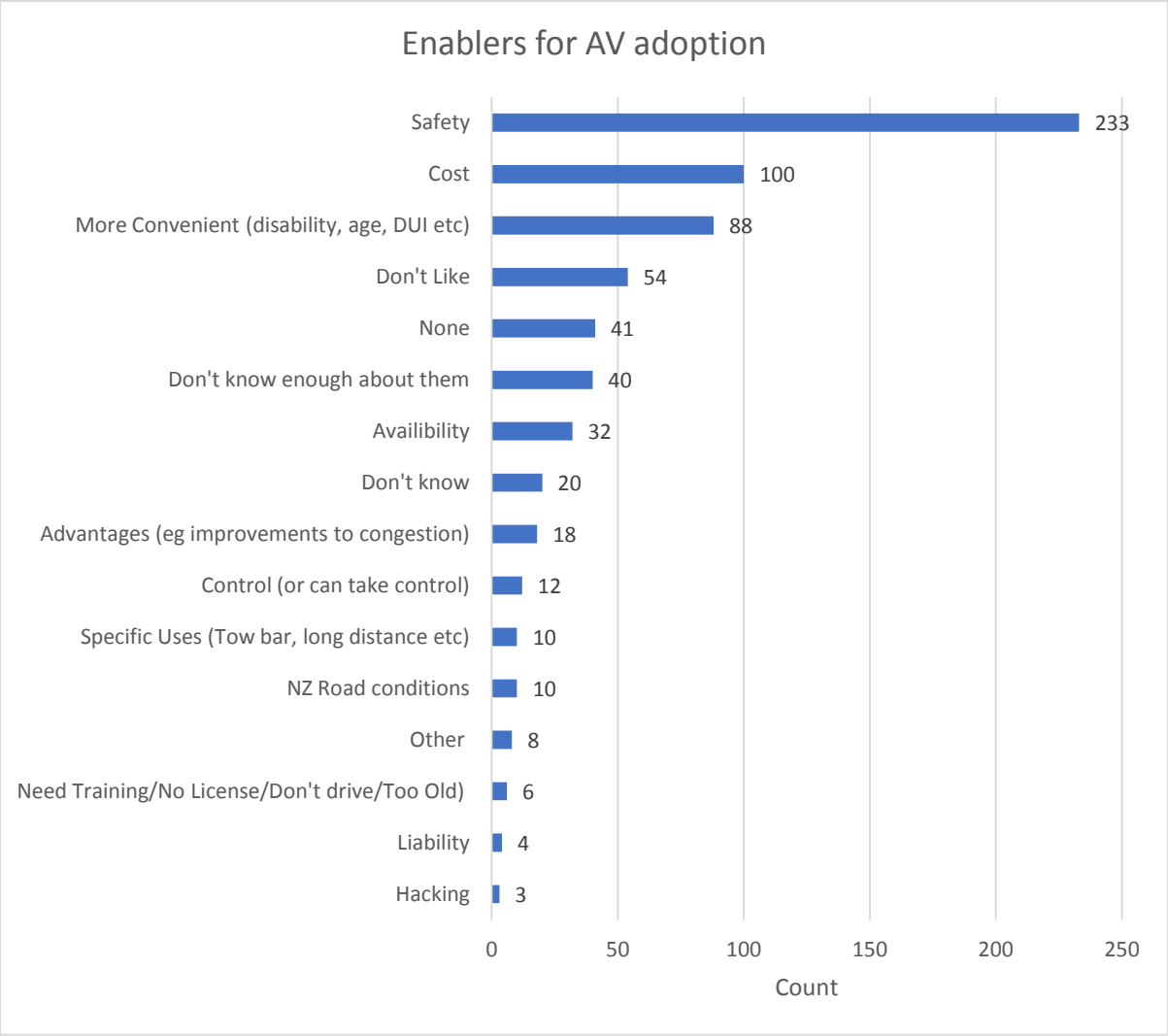
Figure 4.5 – Barriers to self-driving car adoption



4.3 – Enablers for self-driving car adoption

Safety (38%) was also the biggest enabler for self-driving car adoption, cost (16.2%) and convenience (14.3%) were the next two most cited. A few (8.8%) subjects said that they just don't like the idea of self-driving cars, without giving a specific reason. The full data is shown in Figure 4.6. Females are more likely to state that they don't know enough about self-driving cars and males are more likely to cite availability as an issue. Residents of Auckland are more likely to cite availability and advantages (such as congestion) as an enabler for self-driving car adoption than the Other Regions.

Figure 4.6 – Enablers for self-driving car adoption



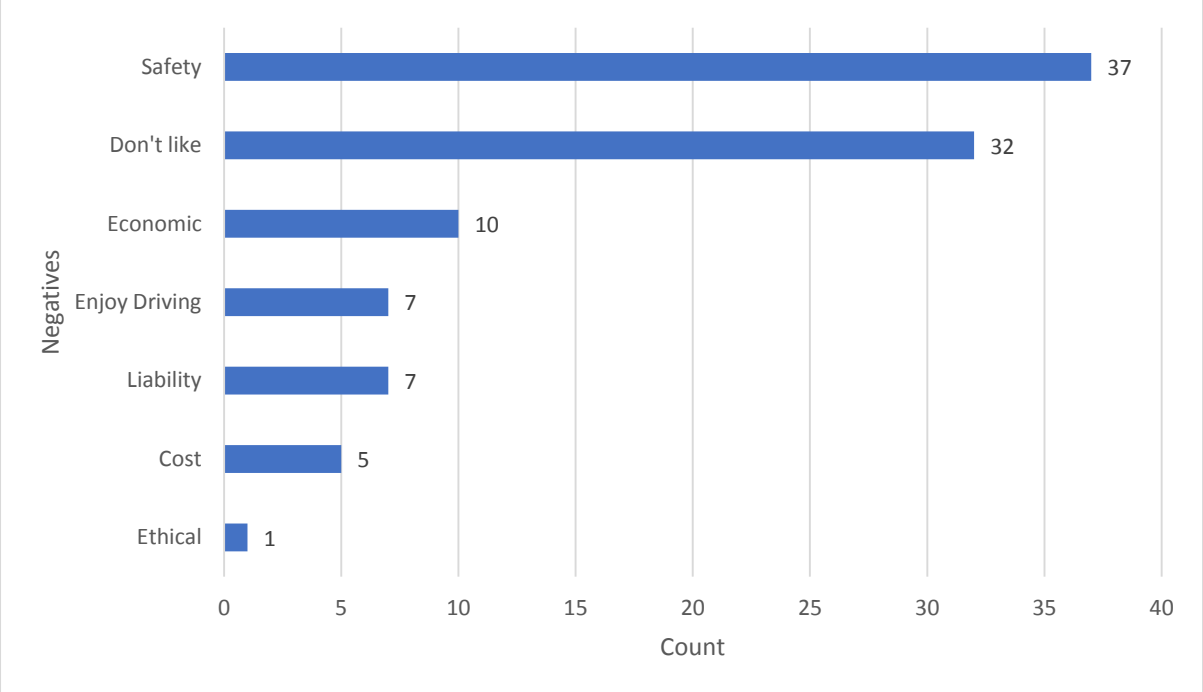
Chapter 5 – Stuff comments subsection

In order to add an extra point of analysis and gain an understanding of the public debate over self-driving vehicles, the comments on three different stuff.co.nz articles were analysed to understand the viewpoint of the vocal minority. 214 total comments were analysed and were coded into categories similar to the barriers and enablers of self-driving cars section of the report. Negative comments are compared to barriers and positive comments to enablers. No specific statistical information can be inferred from this data, especially considering the sample size, and no demographic information was available for further analysis.

Negative comments

Safety is, like the survey results, the most common concern commentators had with self-driving cars. A significant number of commenters also simply did not like them, without specifically citing a reason – "I just don't like the idea of them". Perhaps the most interesting result here is the worry of potential economic impact on the transport industry due to drivers being replaced by autonomous vehicles. Comments along this line referenced both the trucking industry, as well as potential disruptions to the taxi business model through disruptions such as self-driving ubers. Legal liability was also more commonly cited (proportionally), with one commentator questioning "If the driverless car crashes (and they have) who is responsible ?". Figure 5.1 shows the full results.

Figure 5.1 – Negative stuff comments

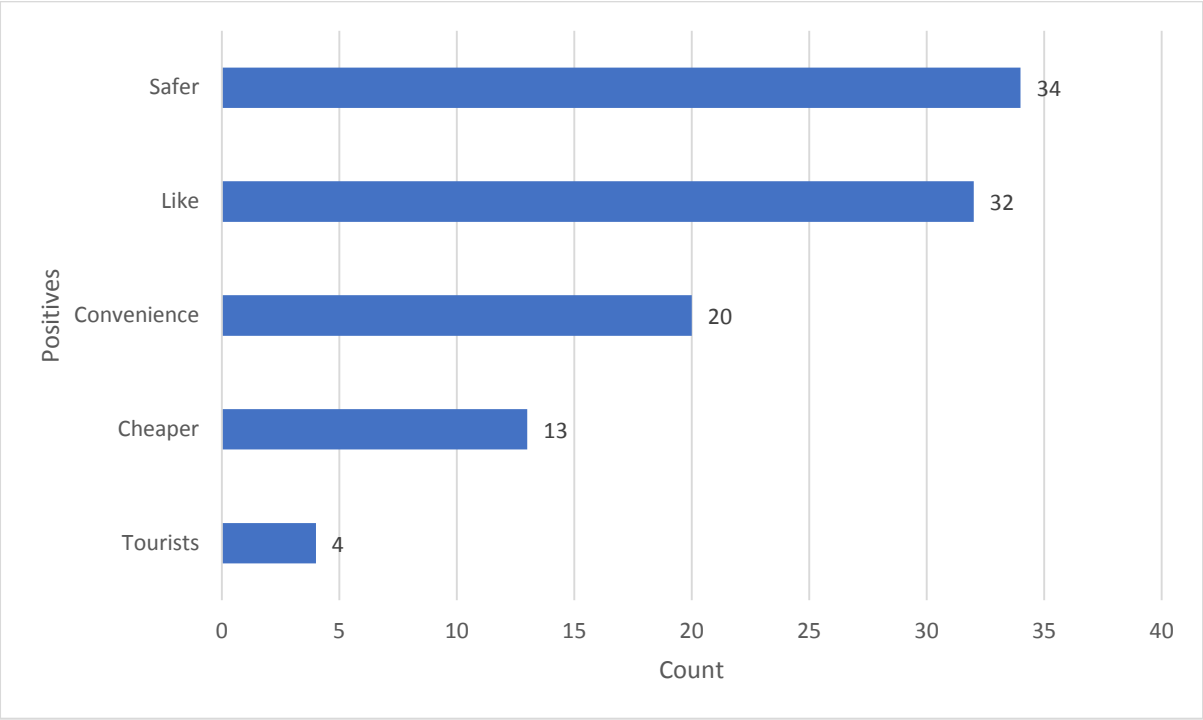


Positive comments

The safer category was the most commonly cited among the positive comments. It is important to note that this differs from the surveys enablers in that respondents specifically cited the safety advantages that autonomous vehicles offer, whereas the survey respondents more commonly said

that self-driving cars being safer would enable their use. The 'cheaper' code also refers to respondents specifically citing that AVs would allow for cheaper transportation through schemes such as self-driving Ubers. Convenience was a common discussion topic, with multiple users asking if these vehicles would mean they could use them while intoxicated. There was considerable discussion around these topics, with the general consensus indicating that this would eventually be the case. The advantages of these vehicles for older people, as well as the blind, were also mentioned. There were also a few mentions of how this would help keep less experienced drivers off NZ roads. Figure 5.2 shows the full results.

Figure 5.2 – Positive stuff comments



Discussion

Overall, there were a lot of similarities between the stuff comments and survey results – especially in areas such as safety, convenience and cost. The major differences between the stuff comments and survey results came in the form of the economic issue that was frequently mentioned in the stuff comments, but not mentioned at all by survey respondents. This is a particularly interesting result and there are two potential reasons for it. The first is related to the survey question which was: "Please describe the biggest barriers for you using a self-driving car". This question resulted in people stating what problems they personally had with self-driving cars, and did not encompass other broader societal impacts. The second relevant factor was that the stuff comments appeared have a higher number of people with knowledge of self-driving cars commenting on them compared to the survey. This appeared to be the case (but cannot be measured), with commentators specifically discussing how self-driving vehicles would lower the cost of transportation and make it safer. This is particularly interesting, because it suggests that as knowledge of self-driving cars becomes more apparent, so will knowledge of the economic issues that come with it. This is important to consider when considering future policy in this area.

Chapter 6 – Conclusion

This document reported on the Transport Technologies section of the Ministry of Transport's Leading Indicators of Change work. The survey questioned respondents about four different types of transport technology – electric cars, hybrid cars, electric bikes and self-driving vehicles. The questions covered subjects' awareness, knowledge, attractiveness and use of new transport technologies. They were then asked what they considered to be the biggest barriers and enablers to the adoption of these technologies.

Electric Vehicles

The three different types of electric vehicles all returned relatively similar results, electric cars were what respondents were most aware of (98.2%), though awareness of all three technologies was above 90%. Electric cars were what respondents self-reported themselves as most knowledgeable about (51.1%), but hybrid cars (50.3%) and electric bikes (49.3%) had a similar result. The pattern continued, and electric cars were also found the most attractive (60.6%), though hybrid cars (56.3%) and electric bikes (53.4%) were in the same ballpark. The pattern broke when it came to actual use, however. Hybrid cars were the most used on a monthly basis at 7.5%, compared to 3.4% for electric bikes and 2.3% for electric cars. Another consistent pattern was that men were more likely to consider themselves knowledgeable about electric vehicles, and to find them more attractive.

The biggest barriers for electric vehicles were cost and lack of charging stations. The most cited enablers (ranked by total number of citations) were cost, speed/distance parity with petrol cars, availability of charging stations, and subsidisation. These results indicate that stimulating the adoption of electric cars can best be accomplished by addressing the cost issue and facilitating the introduction of more charging stations.

Self-driving Cars

Awareness of self-driving cars (94.5%) was similar to electric vehicles, but knowledge (41.6%) was approximately 10% lower and attractiveness (40.9%) was approximately 15% lower. Actual use was not markedly different from electric cars and bikes. Like electric vehicles, men were more likely to consider themselves knowledgeable about self-driving cars, find them more attractive, and would have feel safer travelling in one.

Safety (50.8%) was by far the biggest barrier cited for self-driving vehicles, with control (14%) and cost (13.5%) coming second and third. Safety (38%) was also the most cited enabler, with cost (16.2%) and convenience (16.3) coming second and third. A few subjects (6.5%) stated that they did not know enough about the technology to accurately judge.

The public conversation about self-driving vehicles, through comments analysed on stuff.co.nz, showed a similar picture to the one painted by the survey, but the most interesting difference was the common citation of the potential economic impacts of self-driving vehicles. This encompassed both the commercial transport sector drivers being replaced, as well as public transport through the disruption of the taxi business model.

Accordingly, stimulating the adoption of self-driving cars could best be accomplished by educating the public about the benefits of the technology, as well planning how to mitigate the economic issues inherent to the idea.

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Ministry Disclaimer

This work used survey data sourced from the Ministry of Transport, and other sources.
The Ministry sponsored the author (a University of Otago summer student) to analyse and report on the survey results. The opinions expressed in this paper are those of the author and do not necessarily represent the views of the Ministry of Transport.

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